AGRICULTURAL MACHINERY SELECTION:

SOIL STRENGTH and OPERATIONAL TIMELINESS

by

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Table 3.1 Mean energy requirements for different field operations (Dwyer, 1985).

Operation	Energy requirements, kWh/ha
Ploughing	70
Subsoiling/Moling	60
Forage harvesting	40
Rotary cultivating	40
Cultivating	30
Disc harrowing	30
Mowing	25
Drilling	20
Hoeing	20
Spring tine harrowing	20
Dutch harrowing	15
Rolling	15
Baling	10
Tedding	10
Spraying	5
Fertiliser distributing	5

Table 3.2 List of machine types (Audsley and Wheeler, 1978)

Machine	Resale value group	Repair type	Wear-out life Class	Wear-out life Hours
Stationary power unit	1	2	1	12,000
Tractor 2 WD	1 or 5 *	2	1	12,000
Tractor 4 WD	1 or 5 *	1	1	12,000
Tractor crawler	1	1	1	12,000
Combine PTO	2	5	4	2000
Combine self-propelled	2 or 6 *	3	4	2000
Swather self-propelled	2	5	2	2500
Forage wagon and box	2	5	2	5000
Fertilizer equipment, dry or liquid	3	6	5	1200
Floats and scrapers	3	3	3	2500
Harvester flail	3	4	4	2000
Harvester, potato or sugar beet	3	4	3	2500
Hay conditioner	3	5	3	2500
Land plane	3	3	3	2500
Loader ensilage	3	5	4	2000
Loader, front end	3	3	3	2500
Manure spreader	3	3	3	2500
Mower	3	7	4	2000
Rake, side delivery	3	5	3	2500
Seeding equipment	3	5	5	1200
Sprayer, mounted	3	5	5	1200
Tillage equipment, ploughs, planters, cultivators, harrows, etc.	3	7	3	2500
Truck, feed	3	3	3	2500
Truck, farm	3	4	4	2000
Truck, pick up	3	3	4	2000
Wagon, feed	3	5	3	2500
Baler with engine	4	3	3	2500
Baler PTO	4 or 7 *	4	3	2500
Blower ensilage	4	4	4	2000
Forage harvester, towed	4	4	4	2000
Forage harvester, self-propelled	4	3	4	2000
Sprayer, self-propelled	4	3	4	2000

* These resale values have been calculated from U.K. data

Table 3.3 values of A_s and B_s coefficients for different resale groups.

Group	A_s	B_s
1	68.0	0.920
2	64.0	0.885
3	60.0	0.885
4	56.0	0.885
*5	78.2	0.825
*6	97.0	0.796
*7	97.9	0.821

* derived from British data

Table 3.4 Values of A_r and B_r coefficients for different repair groups.

Group	A_r	B_r
1	0.100	1.5
2	0.120	1.5
3	0.096	1.4
4	0.1 7	1.4
5	0.159	1.4
6	0.191	1.4
7	0.301	1.3

Table 3.5 Values of the repair cost coefficients for the indices of accumulated repair costs for various types of machines (ASAE, 1980).

Machine	Repair cost coefficients	
	A_r	B_r
Tractors	0.012	2.033
Combine self-propelled	0.052	2.122
Corn pickers	0.686	2.348
Moulboard ploughs	0.360	1.810
Disk harrows	0.012	1.714
Chisel ploughs and field cultivators	0.037	1.400
Row planters	0.093	2.137
Grain drills	0.089	2.626
Row cultivators	0.023	2.207
Rotary hoes	0.012	1.369
PTO windrower-conditioners	0.063	1.585
PTO forage harvesters	0.158	0.165
Stalk choppers	2.120	0.904

Table 4.1 Site, soil series, soil type, surface cover and topography.

Ref.	Site	Soil series	Soil type	Surface cover	Topograpy
1	Bush Estate				
		Darvel	Loamy sand	Grass	Flat
		Winton	Sandy loam	Stubble	10% Slope
2	Stirling				
		Stirling	Silty clay loam	Undersown	Flat
			Silty clay loam	Stubble	Flat
			Silty clay	Grass	Flat

Table 4.2 Soil mechanical analysis, clay ratio and location.

Soil type	Sand, % coarse	Sand, % fine	Sand, % total	Silt, %	Clay, %	Clay ratio	Site
Loamy sand	35.35	48.95	84.30	6.30	9.40	0.10	Bush Estate
Sandy loam	29.05	34.70	63.75	19.25	17.00	0.21	
Sandy loam	24.90	31.35	56.25	24.50	19.25	0.24	Bush Estate
Sandy clay loam	19.35	37.40	56.75	22.75	20.50	0.26	
Sandy clay loam	22.05	36.70	58.75	20.75	20.50	0.26	
Silty clay loam	2.80	3.10	6.90	60.10	33.00	0.49	Stirling
Silty clay loam	1.90	2.30	4.20	60.80	35.00	0.54	
Silty clay	0.50	1.00	1.50	52.00	46.50	0.87	
Clay	NA	NA	12.90	26.00	61.10	1.60	Silsoe +

NA Not available

Source: + Stafford, 1984.

Table 4.3 Measured and predicted cone penetration resistance for Darvel soil series (loamy sand, clay ratio = 0.10), together with soil data.

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa				
			Measured	Predicted by Eqn 4.6 with coeffs for			
				Individual soil	Data sets I	Data sets I+III	All soils
1 1	12.75	13.16	2.758	2.814	2.584	2.722	2.480
1 2	11.99	12.48	3.172	2.891	2.597	2.794	2.522
1 3	12.74	10.79	3.350	3.289	2.908	3.177	2.848
1 4	13.85	11.30	3.284	3.250	2.939	3.142	2.844
1 5	13.65	10.07	3.597	3.514	3.109	3.395	3.043
2 1	12.16	15.54	2.818	2.391	2.264	2.315	2.139
2 2	14.43	17.54	2.663	2.275	2.302	2.206	2.101
2 3	14.11	16.86	2.646	2.338	2.329	2.267	2.143
2 4	12.82	14.01	2.861	2.672	2.490	2.585	2.372
2 5	14.63	10.10	2.982	3.571	3.198	3.451	3.110
3 1	13.61	13.06	2.673	2.889	2.679	2.794	2.558
3 2	13.89	15.12	2.732	2.566	2.473	2.485	2.315
3 3	13.88	15.71	2.749	2.479	2.413	2.401	2.247
3 4	13.57	13.94	2.741	2.733	2.571	2.644	2.436
3 5	13.84	14.25	2.853	2.699	2.562	2.613	2.417
4 1	14.47	15.89	2.448	2.492	2.453	2.415	2.271
4 2	14.42	17.08	2.353	2.331	2.340	2.260	2.145
4 3	14.29	16.58	2.465	2.387	2.371	2.313	2.185
4 4	14.45	17.07	2.646	2.334	2.344	2.263	2.148
4 5	14.45	16.57	2.448	2.398	2.388	2.325	2.198
5 1	14.20	17.21	1.913	2.300	2.308	2.230	2.116
5 2	13.10	16.82	2.077	2.278	2.235	2.207	2.073
5 3	13.43	19.18	1.948	2.025	2.080	1.965	1.885
5 4	14.59	16.92	1.836	2.362	2.370	2.290	2.173
5 5	14.76	16.25	1.887	2.461	2.447	2.386	2.254

Table 4.4 Measured and predicted cone penetration resistance for Winton soil series (sandy loam, clay ratio = 0.21), together with soil data.

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted by Eqn 4.6 with coeffs for: Individual soil	Data sets I	Data sets I+III	All soils
1 1	13.56	21.79	1.715	1.584	1.766	1.910	1.720
1 2	13.49	23.75	1.655	1.403	1.612	1.698	1.547
1 3	13.66	19.74	1.827	1.809	1.956	2.173	1.933
1 4	13.83	21.19	1.732	1.653	1.832	1.992	1.789
1 5	14.30	20.60	1.741	1.730	1.911	2.083	1.869
2 1	13.31	23.46	1.439	1.423	1.623	1.720	1.563
2 2	13.03	21.91	1.508	1.557	1.726	1.876	1.685
2 3	14.02	22.18	1.560	1.560	1.760	1.883	1.704
2 4	13.59	21.67	1.612	1.597	1.777	1.926	1.732
2 5	14.07	21.38	1.413	1.640	1.829	1.978	1.781
3 1	13.03	21.28	1.594	1.621	1.779	1.951	1.745
3 2	13.21	21.70	1.500	1.583	1.753	1.908	1.713
3 3	13.50	21.26	1.508	1.636	1.807	1.971	1.768
3 4	13.91	22.09	1.637	1.565	1.761	1.889	1.707
3 5	13.76	20.86	1.856	1.686	1.857	2.030	1.819
4 1	13.94	23.93	1.363	1.401	1.625	1.697	1.553
4 2	13.44	24.01	1.293	1.380	1.591	1.671	1.525
4 3	13.21	22.63	1.380	1.494	1.679	1.803	1.629
4 4	13.45	23.39	1.405	1.433	1.636	1.732	1.575
4 5	13.91	22.85	1.353	1.494	1.702	1.806	1.640
5 1	13.75	24.49	1.301	1.350	1.577	1.637	1.502
5 2	14.07	24.71	1.314	1.342	1.581	1.629	1.499
5 3	13.55	24.09	1.677	1.377	1.592	1.667	1.523
5 4	13.04	28.72	0.981	1.047	1.301	1.279	1.204
5 5	14.38	25.17	1.317	1.316	1.569	1.600	1.480

Table 4.5 Measured and predicted cone penetration resistance for Stirling soil series (silty clay loam, clay ratio = 0.49), together with soil data.

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture conent, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted by Eqn 4.6 with coeffs for: Individual soil	Data sets III	Data sets I+III	All soils
1 1	11.91	13.95	3.757	4.189	4.351	4.389	3.599
1 2	12.23	15.62	3.766	3.834	3.978	3.946	3.243
1 3	13.11	15.14	3.587	3.986	4.135	4.082	3.357
1 4	12.69	17.24	3.775	3.535	3.665	3.564	2.938
1 5	11.70	16.60	3.620	3.604	3.739	3.699	3.041
2 1	11.90	22.81	2.637	2.610	2.700	2.499	2.074
2 2	12.24	22.99	2.844	2.606	2.694	2.476	2.057
2 3	12.23	22.13	2.857	2.720	2.813	2.612	2.167
2 4	12.21	21.58	2.844	2.795	2.892	2.703	2.241
2 5	12.07	24.96	2.827	2.359	2.436	2.188	1.825
3 1	12.08	26.05	2.368	2.240	2.312	2.046	1.710
3 2	11.87	24.61	2.422	2.387	2.466	2.233	1.860
3 3	11.86	24.35	2.456	2.417	2.498	2.270	1.889
3 4	11.96	27.64	2.323	2.075	2.140	1.855	1.555
3 5	11.47	24.21	2.704	2.412	2.493	2.284	1.899
4 1	11.91	28.40	2.120	2.003	2.064	1.771	1.487
4 2	11.53	30.40	2.060	1.813	1.867	1.564	1.318
4 3	11.28	32.49	1.819	1.647	1.693	1.378	1.167
4 4	11.07	34.53	1.784	1.505	1.545	1.219	1.038
4 5	10.79	34.10	1.888	1.515	1.557	1.246	1.058
5 1	12.00	37.57	1.114	1.393	1.426	1.036	0.895
5 2	11.85	35.65	1.181	1.484	1.522	1.153	0.988
5 3	12.29	32.00	1.146	1.737	1.785	1.432	1.216
5 4	12.12	37.92	1.086	1.383	1.415	1.018	0.880
5 5	11.67	37.08	1.120	1.399	1.433	1.060	0.913
6 1	12.37	35.30	1.215	1.533	1.571	1.184	1.016
6 2	11.95	38.58	1.301	1.343	1.374	0.979	0.848
6 3	12.00	40.16	1.250	1.278	1.305	0.898	0.783
6 4	11.42	41.80	1.319	1.182	1.207	0.814	0.713
6 5	11.72	42.76	1.086	1.165	1.188	0.777	0.685

Table 4.6 Measured and predicted cone penetration resistance for Stirling soil series (silty clay loam, clay ratio = 0.54), together with soil data.

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted Eqn 4.6 with coeffs for: Individual soil	Data sets III	Data sets I+III	All soils
1 1	11.67	21.83	3.887	3.468	2.895	2.798	2.308
1 2	12.36	21.88	3.870	3.469	2.922	2.798	2.311
1 3	12.86	20.81	3.852	3.712	3.113	2.994	2.472
1 4	11.90	19.56	3.783	3.990	3.275	3.222	2.651
1 5	13.34	19.55	3.870	4.018	3.348	3.242	2.673
2 1	12.41	28.41	2.387	2.346	2.126	1.884	1.574
2 2	12.96	30.14	2.449	2.130	1.993	1.707	1.434
2 3	11.79	28.86	2.448	2.274	2.052	1.827	1.525
2 4	11.89	29.05	2.413	2.250	2.039	1.807	1.510
2 5	12.01	27.27	2.663	2.503	2.222	2.012	1.676
3 1	11.75	30.58	1.681	2.055	1.895	1.649	1.381
3 2	11.76	28.90	1.801	2.268	2.046	1.822	1.521
3 3	11.86	29.37	1.724	2.208	2.007	1.773	1.482
3 4	11.11	33.70	1.680	1.704	1.622	1.365	1.150
3 5	11.69	32.76	1.627	1.810	1.718	1.449	1.220
4 1	11.17	32.03	1.534	1.878	1.748	1.506	1.264
4 2	11.65	32.39	1.666	1.848	1.744	1.481	1.245
4 3	11.08	33.08	1.551	1.766	1.665	1.415	1.190
4 4	11.33	34.12	1.508	1.668	1.604	1.335	1.126
4 5	12.31	35.51	1.658	1.558	1.563	1.244	1.057
5 1	11.03	41.73	1.284	1.090	1.183	0.866	0.746
5 2	11.73	38.94	1.276	1.280	1.344	1.019	0.873
5 3	11.52	42.57	1.310	1.051	1.173	0.833	0.722
5 4	11.60	44.05	1.172	0.975	1.122	0.771	0.673
5 5	11.93	42.01	1.181	1.090	1.216	0.864	0.749
6 1	11.81	42.30	1.103	1.071	1.198	0.849	0.736
6 2	12.26	38.95	1.353	1.289	1.370	1.025	0.880
6 3	12.24	40.97	1.267	1.157	1.275	0.918	0.794
6 4	12.26	41.02	1.117	1.154	1.274	0.915	0.792
6 5	11.95	43.08	0.922	1.031	1.175	0.816	0.710

Table 4.7 Measured and predicted cone penetration resistance for Stirling soil series (silty clay , clay ratio = 0.87), together with soil data.

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa				
			Measured	Predicted Eqn 4.6 with coeffs for			
				Individual soil	Data sets III	Data sets I+III	All soils
1 1	12.22	18.42	4.757	4.378	4.322	4.662	3.789
1 2	12.36	17.11	4.688	4.725	4.616	4.995	4.058
1 3	12.86	16.93	4.611	4.777	4.670	5.046	4.100
1 4	14.57	16.85	4.645	4.807	4.734	5.079	4.130
2 1	12.42	21.14	3.792	3.740	3.785	4.043	3.290
2 2	12.68	21.53	3.447	3.658	3.720	3.963	3.226
2 3	12.64	21.21	3.447	3.726	3.778	4.029	3.279
2 4	12.67	21.86	3.620	3.588	3.661	3.895	3.171
3 1	11.91	25.14	3.335	2.965	3.105	3.276	2.670
3 2	11.84	26.63	3.146	2.721	2.889	3.031	2.472
3 3	11.61	24.45	3.404	3.084	3.202	3.395	2.765
3 4	12.14	25.60	3.172	2.889	3.043	3.200	2.609
4 1	12.02	26.15	2.344	2.798	2.961	3.109	2.535
4 2	11.88	28.50	2.258	2.443	2.644	2.750	2.246
4 3	11.92	29.85	2.103	2.261	2.483	2.564	2.096
4 4	12.12	30.70	2.068	2.154	2.391	2.455	2.008
5 1	11.97	37.27	1.346	1.481	1.773	1.750	1.439
5 2	11.64	38.39	1.327	1.389	1.679	1.651	1.358
5 3	11.75	42.52	1.125	1.101	1.409	1.339	1.108
5 4	12.17	38.59	1.258	1.376	1.678	1.637	1.349
6 1	10.96	46.10	0.948	0.899	1.197	1.114	0.924
6 2	12.04	40.36	1.250	1.245	1.552	1.496	1.234
6 3	12.00	38.91	1.301	1.350	1.651	1.610	1.326
6 4	11.74	45.69	1.172	0.923	1.237	1.143	0.949

Table 4.8 Measured and predicted cone penetration resistance for Winton soil series (sandy silty loam, clay ratio = 0.24), together with soil data (Eradat Oskoui and Witney, 1982).

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa Measured	Predicted Eqn 4.6 with coeffs for Individual soil	Data set II	All soils
1	12.93	24.60	1.061	1.033	0.971	1.480
2	12.93	28.50	0.730	0.903	0.821	1.212
3	12.93	25.10	0.910	1.014	0.949	1.440
4	12.93	29.22	0.834	0.883	0.799	1.171
5	12.93	23.09	0.868	1.095	1.043	1.608
6	12.80	26.80	1.165	0.949	0.877	1.313
7	12.80	28.80	0.751	0.889	0.808	1.189
8	12.80	24.17	1.034	1.044	0.986	1.510
9	12.80	30.27	0.848	0.851	0.763	1.110
10	12.80	28.63	0.965	0.894	0.813	1.199
11	12.91	26.05	1.199	0.979	0.909	1.369
12	12.91	30.30	0.730	0.855	0.766	1.113
13	12.91	26.75	1.061	0.955	0.882	1.321
14	12.91	26.05	0.882	0.979	0.909	1.369
15	12.91	31.26	0.841	0.832	0.740	1.066
16	12.44	26.65	1.116	0.939	0.871	1.310
17	12.44	29.00	0.827	0.868	0.790	1.164
18	12.44	27.20	1.041	0.921	0.850	1.273
19	12.44	27.86	0.889	0.901	0.827	1.232
20	12.54	28.82	0.854	0.877	0.799	1.178
21	12.54	27.30	0.985	0.922	0.850	1.271
22	12.54	29.80	0.813	0.851	0.769	1.125
23	12.54	25.00	0.965	1.001	0.941	1.433
24	12.54	28.45	0.972	0.888	0.810	1.200
25	12.54	29.13	0.854	0.869	0.789	1.161

Table 4.9 Measured and predicted cone penetration resistance for Macmerry soil series (sandy silty loam, clay ratio = 0.26), together with soil data (Eradat Oskoui and Witney, 1982).

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted Eqn 4.6 with coeffs for: Individual soil	Data set II	All soils
1	12.25	27.55	0.558	0.764	0.827	1.255
2	12.25	26.11	0.683	0.815	0.883	1.355
3	12.25	33.04	0.517	0.616	0.664	0.962
4	12.25	36.52	0.524	0.551	0.591	0.832
5	12.24	34.45	0.531	0.587	0.632	0.904
6	12.24	30.76	0.586	0.670	0.723	1.068
7	12.24	28.87	0.869	0.722	0.781	1.172
8	12.24	25.19	0.779	0.850	0.922	1.426
9	12.25	27.09	0.807	0.780	0.844	1.286
10	12.25	25.07	0.889	0.856	0.928	1.436
11	12.25	31.07	0.586	0.662	0.714	1.053
12	12.25	33.95	0.572	0.598	0.643	0.924
13	12.29	34.14	0.565	0.595	0.640	0.918
14	12.29	30.71	0.676	0.673	0.726	1.072
15	12.29	24.16	0.978	0.895	0.972	1.513
16	12.29	26.31	0.862	0.809	0.876	1.342
17	12.27	25.58	0.827	0.836	0.906	1.396
18	12.27	25.66	1.000	0.833	0.903	1.390
19	12.27	32.26	0.793	0.634	0.683	0.997
20	12.27	35.51	0.676	0.569	0.611	0.867
21	12.19	27.72	0.655	0.757	0.819	1.242
22	12.19	28.99	0.607	0.717	0.775	1.163
23	12.19	33.12	0.407	0.613	0.660	0.956
24	12.19	41.40	0.351	0.483	0.517	0.699
25	11.79	34.51	0.572	0.574	0.617	0.887
26	11.79	29.66	0.710	0.687	0.742	1.111
27	11.79	31.90	0.627	0.629	0.678	0.996
28	11.79	38.93	0.489	0.502	0.538	0.745
29	11.67	40.96	0.537	0.474	0.507	0.691
30	11.67	31.18	0.634	0.643	0.694	1.027
31	11.67	31.31	0.765	0.640	0.690	1.021
32	11.67	35.28	0.599	0.556	0.598	0.854
33	12.43	34.04	0.641	0.601	0.646	0.927
34	12.43	29.57	0.731	0.707	0.764	1.138
35	12.43	29.94	0.669	0.697	0.753	1.118
36	12.43	38.22	0.545	0.530	0.568	0.787
37	12.15	42.29	0.579	0.473	0.505	0.679
38	12.15	32.46	0.703	0.626	0.675	0.983
39	12.15	29.06	0.772	0.714	0.772	1.158
40	12.15	32.06	0.703	0.636	0.685	1.002

Table 4.10 Measured and predicted cone penetration resistance for Silsoe soil series (dry clay soil, clay ratio = 1.60), together with soil data (Stafford, 1984).

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted Eqn 4.6 with coeffs for: Individual soil	Data set IV	All soils
1	17.85	31.95	2.100	3.265	3.220	3.561
2	15.49	33.10	2.000	3.060	3.052	3.400
3	13.62	33.50	4.300	2.949	2.976	3.342
4	12.16	33.70	1.900	2.872	2.929	3.311
5	15.10	46.30	3.000	2.061	1.928	2.054
6	16.97	27.40	2.500	3.727	3.768	4.236
7	16.87	44.00	2.200	2.268	2.115	2.248
8	16.48	39.55	1.600	2.555	2.452	2.660
9	17.47	44.25	1.500	2.276	2.107	2.229
10	17.16	34.80	4.000	2.969	2.903	3.191
11	18.14	29.25	4.600	3.560	3.547	3.949
12	18.14	28.75	4.500	3.616	3.611	4.026
13	17.16	36.70	1.800	2.806	2.717	2.968
14	15.79	30.75	1.500	3.306	3.323	3.721
15	17.36	23.35	3.800	4.264	4.367	4.950
16	16.72	27.95	4.500	3.652	3.690	4.146
17	17.85	29.20	4.700	3.554	3.548	3.956
18	14.71	30.00	4.600	3.343	3.394	3.826
19	15.10	29.35	5.200	3.429	3.482	3.924
20	15.98	38.65	2.100	2.604	2.520	2.752
21	17.36	35.50	2.300	2.915	2.836	3.108
22	16.18	30.40	4.200	3.359	3.372	3.773
23	14.61	32.20	2.100	3.113	3.135	3.516
24	16.97	34.15	4.300	3.020	2.966	3.271
25	17.16	32.50	4.600	3.184	3.146	3.484
26	16.87	25.15	2.100	4.002	4.084	4.617
27	16.48	28.30	2.800	3.602	3.640	4.090
28	16.18	31.65	2.700	3.229	3.225	3.596
29	15.30	32.10	3.000	3.150	3.159	3.532
30	17.75	46.00	1.100	2.183	1.994	2.087
31	13.93	33.15	2.600	2.994	3.019	3.388
32	16.18	27.15	3.400	3.725	3.788	4.274
33	16.52	43.20	1.500	2.305	2.166	2.316
34	14.22	31.25	2.900	3.193	3.237	3.645
35	17.85	30.25	4.900	3.440	3.419	3.800
36	15.35	34.00	1.800	2.970	2.954	3.284
37	17.06	32.45	4.900	3.185	3.150	3.491
38	18.54	31.65	3.200	3.322	3.266	3.604
39	15.96	35.00	3.000	2.904	2.862	3.163
40	18.19	35.50	3.400	2.948	2.851	3.111

Table 4.10 Continued

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted Eqn 4.6 with coeffs for: Individual soil	Data set IV	All soils
41	17.85	36.40	3.800	2.858	2.758	3.005
42	18.33	35.50	4.300	2.954	2.853	3.111
43	16.90	38.90	2.100	2.621	2.515	2.729
44	15.84	34.75	3.400	2.922	2.885	3.193
45	15.96	30.30	3.200	3.361	3.380	3.786
46	17.75	47.55	2.100	2.096	1.895	1.968
47	16.80	33.60	4.400	3.065	3.021	3.340
48	16.45	32.25	2.700	3.180	3.162	3.516
49	16.75	30.55	3.100	3.365	3.364	3.753
50	16.26	31.30	3.500	3.268	3.267	3.645
51	15.22	31.55	2.700	3.202	3.220	3.607
52	16.05	41.05	1.700	2.430	2.322	2.511
53	16.60	33.85	2.400	3.033	2.991	3.307

Table 4.11 Measured and predicted cone penetration resistance for Silsoe soil series (wet clay soil, clay ratio = 1.60), together with soil data (Stafford, 1984).

Plot	Soil specific weight,	Soil moisture content,	Cone penetration resistance, MPa			
			Measured	Preddicted Eqn 4.6 with coeffs for		
Ref.	(kN/m3)	(% w/w)		Individual soil	Data set IV	All soils
1	14.86	61.40	1.600	1.189	1.184	1.164
2	13.59	62.80	1.200	1.091	1.113	1.101
3	14.54	61.60	1.100	1.165	1.172	1.154
4	14.22	60.90	1.400	1.146	1.191	1.184
5	12.81	62.70	0.900	1.036	1.103	1.102
6	18.51	61.60	1.600	1.450	1.241	1.168
7	12.74	62.90	0.900	1.030	1.095	1.094
8	15.51	61.60	1.200	1.235	1.189	1.157
9	13.18	57.60	1.300	1.088	1.302	1.335
10	15.71	61.50	1.800	1.250	1.196	1.162
11	11.90	60.00	0.700	0.983	1.185	1.216
12	14.97	63.10	1.500	1.189	1.127	1.093
13	15.25	61.30	1.400	1.218	1.195	1.170
14	13.21	59.90	1.200	1.078	1.211	1.225
15	12.77	61.60	0.900	1.038	1.141	1.148
16	15.65	58.10	2.100	1.263	1.325	1.319
17	12.73	65.00	0.800	1.020	1.026	1.011
18	15.95	62.40	1.300	1.263	1.168	1.125
19	14.22	56.30	1.100	1.170	1.376	1.406
20	12.91	61.90	1.300	1.047	1.133	1.136
21	11.41	59.60	1.000	0.950	1.191	1.233
22	12.67	58.00	1.300	1.049	1.277	1.314
23	11.64	59.40	1.800	0.968	1.203	1.243
24	13.25	63.80	0.900	1.063	1.074	1.059
25	10.66	58.10	0.700	0.904	1.238	1.302
26	14.93	59.90	1.300	1.201	1.241	1.231
27	12.57	61.80	1.600	1.023	1.130	1.139
28	14.41	63.00	1.300	1.149	1.121	1.095
29	11.36	64.30	0.800	0.925	1.025	1.033
30	12.25	65.50	1.400	0.984	1.003	0.991
31	15.02	62.90	0.900	1.194	1.135	1.101
32	14.58	65.40	1.400	1.151	1.046	1.003
33	11.01	63.70	1.100	0.902	1.038	1.055
34	15.54	62.20	1.200	1.234	1.168	1.132
35	11.92	60.50	0.800	0.982	1.166	1.193
36	15.42	60.90	0.800	1.232	1.212	1.188
37	13.95	62.60	1.000	1.118	1.126	1.110
38	13.19	66.30	0.700	1.048	0.995	0.965
39	13.15	59.30	0.800	1.077	1.233	1.253
40	15.54	64.10	1.400	1.226	1.104	1.055

Table 4.11 Continued

Plot Ref.	Soil specific weight, (kN/m3)	Soil moisture content, (% w/w)	Cone penetration resistance, MPa: Measured	Predicted Eqn 4.6 with coeffs for: Individual soil	Predicted Eqn 4.6 with coeffs for: Data set IV	Predicted Eqn 4.6 with coeffs for: All soils
41	12.86	64.10	0.800	1.033	1.057	1.046
42	15.38	63.20	0.800	1.218	1.131	1.090
43	12.41	58.00	1.000	1.030	1.272	1.313
44	15.12	64.50	1.100	1.194	1.084	1.038
45	14.47	61.40	1.000	1.161	1.178	1.163
46	14.56	62.90	0.900	1.161	1.127	1.100
47	15.24	62.30	0.800	1.212	1.159	1.127
48	13.47	64.80	0.800	1.074	1.046	1.021
49	12.96	62.80	1.100	1.046	1.102	1.098
50	13.72	60.40	0.800	1.112	1.201	1.204
51	15.07	58.30	0.900	1.220	1.307	1.307
52	16.20	63.30	1.300	1.277	1.142	1.089
53	16.05	58.20	0.800	1.291	1.328	1.315
54	12.32	60.70	0.600	1.010	1.166	1.186
55	15.76	60.60	1.800	1.258	1.229	1.202
56	12.74	60.90	1.100	1.039	1.166	1.178
57	14.22	60.90	1.100	1.146	1.191	1.184
58	13.93	62.10	1.100	1.119	1.143	1.131
59	13.66	57.70	0.800	1.122	1.307	1.332
60	14.21	62.30	1.000	1.138	1.141	1.123
61	15.59	61.10	1.300	1.243	1.208	1.179
62	12.61	61.40	0.900	1.027	1.145	1.156
63	15.65	61.10	1.300	1.247	1.209	1.180

Table 4.12 Relation between the tangent of friction angle and values of the clay ratio.

Friction angle ϕ, deg	Tan ϕ = 1/1(1 + 2Cr)	Clay ratio (Cr)
45	1	0.
40	0.83	0.10
35	0.70	0.21
30	0.58	0.35
25	0.47	0.57
20	0.36	0.87
15	0.27	1.34
10	0.18	2.35
5	0.09	5.20
1	0.02	28.00

Table 4.13 The relationships between the internal frictional angle, ϕ, tangent of frictional angle, tanϕ, tangent ratio, $\tan^2\psi/\tan\phi$, and values of the clay ratio.

Friction angle ϕ, deg	tan ϕ (rad)	Clay ratio (Cr)	$\tan^2\psi$/ tanϕ (rad)	$5(1+Cr)^2/(1+2Cr)$	tan ϕ = 1/(1+2Cr) (rad)
45	1	0	5.83	5.00	1
40	0.83	0.10	5.48	5.04	0.83
35	0.70	0.21	5.27	5.16	0.70
30	0.58	0.35	5.20	5.36	0.58
25	0.47	0.57	5.28	5.76	0.47
20	0.36	0.87	5.60	6.38	0.36
45	0.27	1.34	5.34	7.47	0.27
10	0.18	2.35	8.05	9.82	0.18
5	0.09	5.20	13.61	16.05	0.09
1	0.02	28.00	57.49	73.77	0.02

Table 4.14 The effect of soil moisture content and clay ratio on the cone penetration resistance for a band of soil specific weight from 10 - 16 kN/m3.

MC	Cone penetration resistance, MPa									
Cr	0		0.2		0.4		0.4		1.6	
Y	10	16	10	16	10	16	10	16	10	16
5.0	1.53	2.45	4.94	5.21	6.01	6.13	7.42	7.47	10.12	10.14
10.0	1.53	2.45	3.41	3.68	4.27	4.39	5.64	5.69	8.36	8.38
15.0	1.53	2.45	2.40	2.67	3.05	3.18	4.29	4.35	6.90	6.92
20.0	1.53	2.45	1.73	2.00	2.20	2.32	3.27	3.33	5.70	5.72
25.0	1.53	2.45	1.30	1.56	1.60	1.73	2.50	2.55	4.71	4.73
30.0	1.53	2.45	1.01	1.27	1.18	1.31	1.91	1.97	3.89	3.91
35.0	1.53	2.45	0.82	1.08	0.89	1.02	1.47	1.52	3.21	3.23
40.0	1.53	2.45	0.69	0.96	0.69	0.81	1.13	1.19	2.66	2.68
45.0	1.53	2.45	0.61	0.88	0.54	0.67	0.88	0.93	2.20	2.22
50.0	1.53	2.45	0.55	0.82	0.44	0.57	0.69	0.74	1.82	1.84
55.0	1.53	2.45	0.52	0.78	0.37	0.50	0.54	0.59	1.51	1.53
60.0	1.53	2.45	0.49	0.76	0.33	0.45	0.43	0.48	1.25	1.27

Cr = Clay ratio,
Y = Soil specific weight, kN/m3,
MC = Soil moisture content, %,w/w.

Table 4·15 Values of the clay ratio, cone penetration resistance coefficients, their standard errors and percentage explanation of the penetration results.

Soil series	Soil type	Clay ratio	Coefficients K_c	Coefficients $K_\Phi \times 10^{-3}$	Standard errors $[K_c$	Standard errors $K_\Phi] \times 10^{-3}$	Expl. %	DF
Darvel	Loamy sand	0.10	4.67	5.84	608.18	1.51	99	24
Winton	Sandy loam	0.21	3.83	4.37	588.62	1.92	99	24
I	Combined		3.19	8.63	475.95	1.29	98	49
Winton	Sandy loam	0.24	1.75	7.51	629.99	1.94	99	24
Macmerry	Sandy clay loam	0.26	1.82	5.39	248.48	0.72	98	39
II	Combined		2.08	5.68	282.53	0.84	98	64
Stirling	Silty clay loam	0.49	3.74	22.72	218.47	3.52	99	29
	Silty clay loam	0.54	5.51	8.12	283.00	3.95	99	29
	Silty clay	0.87	4.67	4.07	190.71	8.50	99	24
III	Combined		3.92	22.71	109.97	2.32	98	83
(I+III)			4.48	5.74	89.18	0.52	98	133
Silsoe	Clay(V.dry)	1.60	2.65	76.41	703.52	77.37	91	52
	(V.wet)	1.60	0.39	139.34	865.98	36.91	94	62
IV	Combined		3.01	33.87	225.30	19.31	91	115
All soils			3.62	6.63	74.20	0.62	93	315

Expl. Explanation,
DF. Degree of freedom,
I Experimental work at Bush Estate,
II Eradat Oskoui and Witney data, 1982,
III Experimental work in Stirling area,
IV Stafford data, 1984.

TABLE 5.1 Timeliness coefficients for early and late establishment of eight crops.

Crop	Establishment period	Timeliness coefficient x10^{-3} [standard error] x10^{-3}	Correlation coefficient	Degrees of freedom
Winter barley	Early	3.10 [0.60]	0.45	50
	Late	3.84 [0.46]	0.57	145
Winter wheat	Early	4.44 [0.49]	0.46	161
	Late	4.35 [0.18]	0.80	319
Spring barley	Early	9.11 [0.86]	0.63	94
	Late	11.02 [0.46]	0.80	328
Spring wheat	Early	8.78 [1.75]	0.64	13
	Late	10.9 [1.14]	0.82	54
Oats	Early	13.5 [1.12]	0.64	145
	Late	19.4 [0.63]	0.84	411
Potatoes (maincrop)	Early	5.81 [0.50]	0.65	117
	Late	9.13 [0.42]	0.79	287
Swedes	Early	17.2 [2.31]	0.58	53
	Late	18.4 [0.93]	0.77	265
Turnips	Early	49.6 [5.53]	0.68	59
	Late	31.7 [2.04]	0.78	154

TABLE 5.2 The optimum establishment day number and peak yield for eight crops at various locations

	Winter barley	Winter wheat	Spring barley	Spring wheat	Oats	Potatoes	Swedes	Turnips
Location: all sites								
Optimum sowing date	15 Oct	23 Oct	18 Mar	18 Mar	23 Mar	14 Apr	5 May	18 May
Optimum day no [SE]	288 [30]	296 [25]	76 [24]	76 [24]	81 [17]	104 [23]	125 [10]	138 [10]
Peak yield (t/ha) [SE]	5.95 [1.56]	6.20 [2.11]	4.88 [0.95]	3.83 [0.74]	4.92 [1.12]	42.21 [9.12]	5.27 [1.98]*	6.44 [1.56]*
Location: Bush Edinburgh								
Optimum sowing date	4 Oct	1 Oct	28 Mar				28 Apr	
Optimum day no [SE]	277 [8]	274 [25]	86 [10]				118 [16]	
Peak yield (t/ha) [SE]	6.18 [1.10]	8.87 [2.03]	6.03 [0.55]	NA	NA	NA	5.52 [1.52]*	NA
Location: Craibstone Aberdeen								
Optimum sowing date	30 Sept		16 Mar		23 Mar	12 Apr	5 May	18 May
Optimum day no [SE]	273 [21]		74 [27]		81 [17]	102 [24]	125 [9]	138 [10]
Peak yield (t/ha) [SE]	6.48 [3.73]	NA	5.06 [0.90]	NA	4.92 [1.12]	42.48 [9.12]	4.00 [1.97]*	6.44 [1.56]*
Location: Arthur Rickwood, Cambridge								
Optimum sowing date	7 Nov	28 Oct		15 Mar				
Optimum day no [SE]	311 [27]	301 [13]		73 [22]				
Peak yield (t/ha) [SE]	5.03 [0.24]	5.33 [0.80]	NA	4.07 [0.85]	NA	NA	NA	NA
Location: Boxworth, Cambridge								
Optimum sowing date	21 Oct	29 Oct	28 Mar	23 Mar				
Optimum day no [SE]	294 [41]	302 [25]	86 [16]	81 [23]				
Peak yield (t/ha) [SE]	6.16 [2.06]	5.93 [1.33]	4.37 [0.48]	3.67 [0.56]	NA	NA	NA	NA

* Yield of dry matter t/ha
NA Not available

TABLE 5.3 The duration of the establishment period before and after peak period yield for various average levels of the percentage yield loss.

Yield loss %		Duration of establishment period before or after peak yield for various crops, days															
		Winter barley		Winter barley		Spring barley		Spring wheat		Oats		Potatoes		Swedes		Turnips	
Av	Margin	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
0.5	1.5	22	20	18	19	13	12	13	12	11	9	16	13	9	9	5	7
1.0	3.0	31	28	26	26	18	16	18	17	15	12	23	18	13	13	8	10
1.5	4.5	38	34	32	32	22	20	23	20	18	15	28	22	16	16	10	12
2.0	6.0	44	40	37	37	26	23	26	23	21	18	32	26	19	18	11	14
2.5	7.5	49	44	41	42	29	26	29	26	23	20	36	29	21	20	12	15
3.0	9.0	54	48	45	45	31	29	32	29	26	22	39	31	23	22	13	17
3.5	10.5	58	52	49	49	34	31	35	31	28	23	43	34	25	24	15	18
4.0	12.0	62	56	52	53	36	33	37	33	30	25	45	36	26	26	16	19
4.5	13.5	66	59	55	56	38	35	39	35	32	26	48	38	27	27	16	21
5.0	15.0	70	63	58	59	41	37	41	37	33	28	51	41	29	29	17	22
5.5	16.5	73	66	61	62	43	39	43	39	35	29	53	44	30	30	18	23
6.0	18.0	76	68	64	64	44	40	45	41	37	30	56	46	32	31	19	24
6.5	19.5	79	71	66	67	46	42	47	42	38	32	58	48	34	33	20	25
7.0	21.0	82	74	69	69	48	44	49	44	39	33	60	49	35	34	21	26
7.5	22.5	85	76	71	72	50	45	51	46	41	34	62	50	36	35	21	27
8.0	24.0	88	79	74	74	51	47	52	47	42	35	64	51	37	36	22	27
8.5	25.5	91	81	76	77	53	48	54	48	44	36	66	53	38	37	23	28
9.0	27.0	93	84	78	79	54	50	55	50	45	37	68	54	40	38	23	29
9.5	28.5	96	86	80	81	56	51	57	51	46	38	70	56	41	39	24	30
10.0	30.0	98	88	82	83	57	52	58	52	47	39	72	57	42	40	25	31

Table 6.1 Calculated Values of tractor price coefficients, their standard errors, and percentage explanation for September, 1983 and July, 1977

Tractor	Coefficients a_t	Coefficients b_e	Standard errors a_t	Standard errors b_e	Exp. %	Degree of freedom
September, 1983						
2-wheel drive	2001.78	191.18	331.25	5.36	88.38	168
4-wheel drive (unequal)	47.87	263.81	755.22	9.63	88.89	144
4-wheel drive (equal)	-314.64	306.49	2714.06	16.68	93.62	24
Crawler	-9357.59	448.70	3271.19	42.25	89.92	16
July, 1977						
2-wheel drive	-117.95	133.83	294.50	4.85	89.86	87
4-wheel drive (unequal)	-755.11	175.94	500.98	4.80	95.87	58
Crawler	-9303.41	347.29	3483.89	53.17	73.99	16

Table 6.2 Calculated values of Plough price coefficients, their standard errors, and percentage explanation for August, 1983 plough list prices

Plough	Coefficients x 10^3			Standard errors x 10^3			Exp.	Degree of freedom
	a_p	b_{nf}	c_{fw}	a_p	b_{nf}	c_{fw}	%	
August, 1983								
Conventional:								
mounted, fixed leg	-0.2493	0.4930	0.3719	0.4265	0.0279	1.3097	88.52	48
mounted, auto-reset	5.3325	0.6226	-15.5947	1.9414	0.0748	5.7882	90.91	9
semi-mounted, fixed leg	4.8296	1.1767	-18.1326	2.1339	0.0929	6.0309	91.47	17
semi-mounted, auto reset	-20.4495	0.7366	57.7118	3.0485	0.1567	9.1950	96.17	7
Reversible:								
mounted, fixed leg	-1.7596	0.9370	5.7480	0.5867	0.0472	1.7318	83.62	92
mounted, auto-reset	-1.8407	0.8747	8.5168	4.2480	0.1419	11.8720	79.20	12
semi-mounted , fixed leg	105.6377	0.7546	-293.5589	31.2850	0.1634	89.8800	78.07	9
semi-mounted, auto-reset	-126.5080	1.5262	363.3793	57.4800	0.3358	16.5500	97.96	3
July, 1980								
Conventional, mounted, fixed leg	-0.7452	0.3730	2.0617	0.3730	0.0266	1.0916	74.05	75
Reversible, mounted, fixed leg	-0.4761	0.6519	15.2293	0.9465	0.0512	2.7349	78.83	65

Table 6.3 Calculated values of drill price coefficients, their standard errors, and percentage explanation for August, 1984, Oct., 1976 and March, 1978.

Drill	Coefficients × 10^3			Standard Errors 10^3			Exp. %	Degree of freedom
	a_d	b_{nc}	c_{cs}	a_d	b_{nc}	c_{cs}		
August, 1984								
Conventional, mounted, grain only	-5.7782	0.1564	35.5892	0.4971	0.0050	3.4885	89.42	121
Conventional, trailed, grain only	-3.3237	0.2328	23.5459	0.8648	0.0092	5.0817	92.61	56
Combine, mounted (grain & fertiliser)	-7.8241	0.1047	68.2914	2.3807	0.0464	15.1320	63.48	15
Combine, trailed (grain & fertiliser)	-4.7843	0.2752	27.6328	0.8514	0.0142	4.2699	86.22	64
Trailed cultivator drills	-2.8445	0.3803	9.0009	3.9450	0.0243	24.5330	93.22	21
Combine, mounted including (direct drill and cultivator)	-0.1889	0.1293	2.9715	1.1480	0.0299	5.9116	46.16	24
Combine, trailed including (direct drill and cultivator)	-9.2819	0.3463	48.6669	1.0291	0.0149	5.7269	86.23	89
Oct., 1976								
Conventional, mounted, grain only	-3.0753	0.0883	15.8776	0.5767	0.0086	2.9235	72.49	40
March, 1978								
Conventional, trailed, grain only	-1.9000	0.1420	8.6482	1.4556	0.0183	7.2251	90.76	10

Table 6.4 Calculated values of cultivator (power-driven) price coefficients, and their standard errors, and percentage explanation for June, 1984 and November, 1977

Cultivator	Coefficients x 10^3 a_c	b_m	c_{nt}	Standard errors x 10^3 a_c	b_m	c_{nt}	Exp. %	Degree of freedom
June, 1984								
Rotary, L-shape	-0.3962	0.3540	0.0308	0.1411	0.1504	0.0041	86.01	73
Rotary, tine	-0.8229	1.3355	0.0055	0.1941	0.1036	0.0023	84.09	73
Harrow	-2.5473	1.9679	-	0.3469	0.0866	-	87.91	72
November, 1977								
Rotary, tine	-0.7772	0.8065	0.01347	0.2392	0.1825	0.0062	76.90	72
Harrow	-1.3270	1.2920	-	0.3243	0.1020	-	88.42	21

Table 6.5 Ten year index of tractor prices (1980 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANAV
74	28.5	28.6	29.3	30.4	30.4	31.7	33.0	33.0	34.0	36.0	36.4	37.4	32.4
75	39.3	40.2	40.9	42.6	43.2	43.4	45.0	46.0	46.6	48.4	49.6	49.9	44.6
76	50.6	53.2	53.5	54.1	55.1	57.3	57.9	58.9	59.8	60.2	61.8	62.3	57.1
77	64.6	66.1	67.0	68.1	70.7	71.8	72.5	74.4	74.4	74.4	75.3	76.4	71.3
78	77.5	77.8	77.8	78.4	79.8	82.1	82.1	82.1	82.1	82.1	83.4	84.1	80.8
79	86.8	86.8	86.8	86.8	86.9	89.0	91.2	91.2	91.2	92.0	92.0	92.1	89.4
80	96.0	96.7	96.7	97.2	100.3	100.5	100.5	101.8	101.8	112.7	102.9	102.9	100.0
81	105.6	106.2	106.6	106.6	106.6	107.0	107.0	107.0	107.0	108.2	108.2	111.2	107.2
82	111.2	111.8	112.0	111.9	112.9	114.3	114.3	114.3	114.5	114.5	114.8	119.4	113.8
83	121.0	121.6	121.6	121.6	122.4	122.5	123.1	124.1	124.5	124.5	124.5	125.1	123.0
84	127.1	127.9	127.9	127.9	127.9	114.1	114.5	114.5	114.5	114.5			

Table 6.6 Ten year index of agricultural machinery (e.g. drill) prices (1980 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANAV
74	34.1	34.4	35.8	36.1	36.7	37.7	38.9	39.3	40.2	40.7	41.9	42.8	38.2
75	43.3	43.8	44.3	45.1	45.6	46.2	47.6	48.2	49.1	49.6	50.0	50.8	47.0
76	51.1	51.1	51.7	52.2	52.4	53.3	56.0	56.4	57.2	58.2	58.9	59.8	54.9
77	62.1	62.3	62.6	64.1	64.8	65.0	67.0	67.4	68.5	69.2	70.1	71.4	66.2
78	73.2	73.4	74.0	74.4	75.9	76.7	77.7	77.8	79.3	79.8	80.9	81.7	77.1
79	82.9	83.0	84.1	84.5	84.6	84.9	89.9	91.0	92.4	93.3	84.2	95.1	88.3
80	96.1	96.4	97.1	98.0	98.7	99.4	100.9	101.0	102.9	102.6	102.9	103.8	100.0
81	103.9	103.7	103.9	104.0	103.9	103.3	105.0	104.8	106.2	106.6	105.3	107.4	104.9
82	109.5	110.3	110.8	110.3	110.7	109.4	113.2	113.3	113.8	114.7	114.8	112.1	111.9
83	112.6	112.5	112.5	112.6	112.6	113.9	114.4	114.4	114.9	116.0	116.2	117.3	114.2
84	117.7	117.7	117.7	118.6	118.9	119.1	119.8	120.0	120.5	120.6			

Table 6.7 Ten year index of soil preparation and cultivation machinery prices (1980 = 100)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANAV
74	34.6	35.0	37.1	37.3	37.3	40.5	42.0	42.1	43.1	43.6	44.3	45.5	40.2
75	46.2	47.7	47.8	48.6	49.0	49.0	51.3	51.4	53.0	53.6	54.0	54.5	50.5
76	54.5	54.5	55.9	56.5	56.5	57.2	59.1	60.3	61.1	62.1	62.6	63.7	58.7
77	66.7	67.1	67.2	67.9	67.9	68.1	71.6	71.9	73.0	73.3	73.7	74.7	70.3
78	77.6	77.7	78.0	78.4	78.5	78.9	80.9	80.9	83.3	83.8	83.8	84.4	80.5
79	84.6	84.8	86.2	86.3	86.3	86.5	87.9	86.5	91.8	93.0	93.1	93.3	88.5
80	93.8	94.4	96.8	96.9	97.5	98.9	103.7	103.7	104.1	104.1	103.7	102.5	100.0
81	102.5	102.0	102.2	102.4	101.8	101.2	100.7	100.3	101.5	102.2	102.2	103.1	101.5
82	103.4	104.2	104.8	105.4	105.1	105.9	106.8	106.8	108.2	108.2	108.2	108.5	106.3
83	108.6	108.7	108.8	109.1	109.1	109.7	110.7	110.7	111.0	111.9	112.1	113.1	110.3
84	113.2	113.2	113.2	113.9	113.9	114.0	116.1	116.7	116.7	117.4			

Table 6.8 The relationship between predicted prices of 2-wheel drive, unequal 4-wheel drive and crawler tractors using the September, 1983 and July, 1977 equation No. (6.1) and the 1983 price index-linked to 1977.

Power kW	September, 1983 £	July, 1977 £	Index-linked July, 1977 £	Difference %
2-wheel drive				
25	6784	3228	3949	+18.26
50	11561	6574	6732	+ 2.35
75	16385	9919	9542	- 3.95
100	21180	13265	12334	- 7.54
125	25974	16611	15126	- 9.82
Unequal 4-wheel drive				
25	6643	3643	3868	+ 5.82
50	13239	8042	7709	- 4.32
75	19834	12440	11550	- 7.71
100	26429	16839	15390	- 9.42
125	33024	21237	19231	-10.43
150	39619	25636	23072	-11.11
175	46215	30034	26912	-11.60
Crawler				
50	13077	8060	7615	- 5.84
75	24295	16742	14148	-18.33
100	25512	25424	20680	-22.94
125	46730	34105	27212	-25.33
150	57945	42787	33812	-26.54

Table 6.9 The relationship between predicted prices of mounted conventional and reversible ploughs with a 0.35 m furrow width using the August, 1983 and July, 1980 equation No. (6.2) and the 1983 price index-linked to 1980.

Furrows	August, 1983 £	July, 1980 £	Index-linked July, 1980 £	Difference %
Conventional Mounted				
2	867	683	812	+15.89
3	1360	1071	1274	+15.93
4	1853	1459	1736	+15.96
5	2346	1847	2197	+15.93
6	2839	2235	2659	+15.95
Reversible Mounted				
2	2126	1873	1992	+ 5.97
3	3063	2525	2869	+11.99
4	4000	3177	3747	+15.21
5	4937	3828	4624	+17.21
6	5874	4480	5503	+18.60

Table 6.10 The relationship between predicted prices of mounted drill, grain only drills with a 0.125 m coulter spacing using the August, 1984 and October, 1976 equation No. (6.3) and the 1984 price index-linked to 1976.

Coulters	Machine width, m	August, 1984 £	October, 1976 £	Index-linked October, 1976 £	Difference %
15	1.875	1016	235	474	+50.42
20	2.500	1798	676	839	+19.43
25	3.125	2579	1118	1204	+ 7.14
30	3.750	3361	1560	1569	+ 0.57
35	4.375	4143	2001	1933	- 3.52
40	5.000	4925	2443	2298	- 6.31
45	5.625	5707	2885	2663	- 8.34
50	6.250	6488	3326	3028	- 9.84
55	6.875	7270	3768	3393	-11.05
60	7.500	8052	4210	3758	-12.03
65	8.125	8834	4742	4122	-15.04

Table 6.11 The relationship between predicted prices of trailed drill, grain only drills with a 0.125 m coulter spacing using the August, 1984 and March, 1989 equation No. (6.3) and the 1984 price index-linked to 1978.

Coulters	Machine width m	August, 1984 £	March, 1978 £	Index-linked March, 1978 £	Difference %
15	1.875	3112	1311	1919	+31.68
20	2.500	4276	2020	2637	+23.40
25	3.125	5440	2730	3355	+18.63
30	3.750	6604	3440	4072	+15.52
35	4.375	7768	4150	4790	+13.36
40	5.000	8932	4860	5508	+11.76
45	5.250	10096	5570	6226	+10.54
50	6.250	11260	6280	6944	+ 9.43
55	6.875	12424	6989	7662	+ 8.78
60	7.500	13588	7699	8379	+ 8.12
65	8.125	14752	8409	9097	+ 7.56

Table 6.12 The relationship between predicted prices of rotary-tined and harrow power driven cultivators using the June, 1984 and November, 1977 equations No. (6.4 and 6.5) and the 1984 price index-linked to 1977.

Tines	Machine width, m	June, 1984 £	November, 1977 £	Index-linked November, 1977 £	Difference %
Rotary-tined					
26	2	1992	1186	1288	+ 7.88
39	3	3399	2166	2197	+ 1.42
52	4	4806	3149	3107	- 1.36
65	5	6213	4131	4017	- 2.84
Harrow					
	2	1389	1257	898	-40.03
	3	3356	2547	2170	-17.47
	4	5324	3841	3442	-11.58
	5	7292	5133	4714	- 8.87
	6	9260	6425	5987	- 7.32
	7	11228	7717	7259	- 6.31
	8	13196	9009	8531	- 5.60
	9	17711	10301	11450	+10.39
	10	19679	11593	12723	+ 8.88

Table 6.13 Proforma programme to calculate the present annual cost of a machine ownership used 1000 h/yr, owned 5 years (i.e. a 62 kW tractor purchase price, PP, $13855 and tax rate 30%) taking into account the effect of inflation and taxation.

Col. Yr	2 Infl-ation rate	3 Inter-est rate	4 Current repair cost $	5 Current insur-ance cost $	6 Current resale value $	7 Actual rep. & ins. costs $	8 Mort-gage value $	9 Actual resale value $	10 Actual capital allow-ance $	11 Actual balan-cing Charge $	12 Actual inter-est charge $	13 Total tax allow-ance $	14 Total tax relief $	15 Actual cash outging $	16 Discount cash flow $	17 Inflation to interest ratio
1	1.050	1.080	166.3	128.4		309.4	3748.8		3463.8		1524.1	5297.2	1589.2	2469.0	2286.1	0.973
2	1.102	1.166	514.2	110.4		688.6	3748.8		2597.8		1279.3	4565.8	1369.7	3067.6	2630.0	0.945
3	1.158	1.260	871.2	95.6		1119.1	3748.8		1948.4		1007.7	4075.2	1222.5	3645.3	2893.8	0.919
4	1.216	1.360	1233.1	83.3		1600.1	3748.8		1461.3		706.2	3767.5	1130.3	4218.6	3100.8	0.893
5	1.276	1.469	1598.5	73.2	5033.1	2132.6	3748.8	5284.8	1096.0	1359.1	371.5	1604.1	481.2	116.3	79.2	0.869
									Box 10						Box 16	Box 17
									10567.3						10989.8	4.598

Col. = Column;
Col.7 = Col.(4+5)*2;
Col.11= Col.(9+Box 10-PP);
Col.14= Col.13*Tax rate;
Col.16= Col.(15/3);
Col.9 = Col.(6*2);
Col.13= Col.(7+10+12-11);
Col.15= Col.(7+8-9-14);
Col.17= Col.(2/3).

PRESENT ANNUAL COST = Box 16/Box 17 = $2390.

Table 7.1 Weekly available soil workdays for Darvel soil series for three soil workability criteria and probability levels.

Week No.	Probability levels, % — 80			90			100		
	Soil workability criteria, % of FC								
	100	105	110	100	105	110	100	105	110
01	0	7	7	0	7	7	0	7	7
02	0	7	7	0	7	7	0	7	7
03	0	7	7	0	7	7	0	5	7
04	0	7	7	0	7	7	0	7	7
05	0	7	7	0	7	7	0	7	7
06	0	7	7	0	7	7	0	6	7
07	1	7	7	0	7	7	0	7	7
08	4	7	7	1	7	7	0	7	7
09	3	7	7	2	7	7	0	7	7
10	6	7	7	2	7	7	0	7	7
11	5	7	7	1	7	7	0	7	7
12	5	7	7	4	7	7	1	7	7
13	3	7	7	2	7	7	0	7	7
14	3	7	7	1	7	7	0	7	7
15	3	7	7	2	7	7	1	7	7
16	6	7	7	4	7	7	2	7	7
17	3	7	7	0	7	7	0	7	7
18	0	7	7	0	7	7	0	7	7
19	0	7	7	0	7	7	0	7	7
20	4	7	7	3	7	7	0	7	7
21	7	7	7	5	7	7	0	7	7
22	7	7	7	5	7	7	3	7	7
23	7	7	7	7	7	7	3	7	7
24	5	7	7	4	7	7	2	7	7
25	4	7	7	3	7	7	3	7	7
26	7	7	7	7	7	7	6	7	7
27	7	7	7	6	7	7	5	7	7
28	7	7	7	6	7	7	3	7	7
29	6	7	7	6	7	7	6	7	7
30	1	7	7	1	7	7	1	7	7
31	5	7	7	4	7	7	4	7	7
32	7	7	7	5	7	7	4	7	7
33	6	7	7	4	7	7	3	7	7
34	7	7	7	7	7	7	4	7	7
35	7	7	7	5	7	7	5	7	7
36	4	7	7	4	7	7	0	7	7
37	7	7	7	5	7	7	2	7	7
38	5	7	7	3	7	7	0	7	7
39	1	6	7	0	6	7	0	6	7
40	0	7	7	0	7	7	0	7	7
41	2	7	7	1	7	7	0	7	7
42	6	7	7	4	7	7	1	7	7
43	5	7	7	0	7	7	0	7	7
44	4	7	7	4	7	7	1	7	7
45	4	7	7	2	7	7	1	7	7
46	2	7	7	1	7	7	0	7	7
47	1	7	7	1	7	7	0	7	7
48	0	7	7	0	7	7	0	7	7
49	4	7	7	3	7	7	0	7	7
50	5	7	7	3	7	7	0	7	7
51	6	7	7	3	7	7	2	7	7
52	7	7	7	5	7	7	5	7	7

Table 7.2 Weekly avaliable soil workdays for Macmerry soil series for three soil workablility criteria and probability levels.

Week	Probability levels, %								
	80			90			100		
	Soil workability criteria, % of FC								
No.	100	105	110	100	105	110	100	105	110
01	3	5	7	3	5	7	0	4	7
02	0	0	7	0	0	7	0	0	5
03	0	2	7	0	2	7	0	0	3
04	0	7	7	0	7	7	0	0	7
05	0	4	6	0	4	6	0	0	6
06	1	2	7	1	2	7	0	1	5
07	6	7	7	6	7	7	0	7	7
08	1	6	6	1	6	6	1	1	6
09	0	7	7	0	7	7	0	4	7
10	1	7	7	1	7	7	0	6	7
11	0	7	7	0	7	7	0	1	7
12	0	6	7	0	6	7	0	1	7
13	0	5	7	0	5	7	0	3	7
14	0	6	7	0	6	7	0	3	7
15	0	5	7	0	5	7	0	1	7
16	0	4	7	0	4	7	0	0	6
17	0	2	7	0	2	7	0	0	5
18	0	4	7	0	4	7	0	0	6
19	0	2	7	0	2	7	0	1	7
20	0	5	7	0	5	7	0	0	6
21	0	3	7	0	3	7	0	0	6
22	0	2	6	0	2	6	0	2	4
23	0	7	7	0	7	7	0	2	7
24	1	7	7	1	7	7	0	3	7
25	1	3	5	1	3	5	0	2	3
26	0	4	7	0	4	7	0	0	6
27	0	6	7	0	6	7	0	2	7
28	3	6	7	3	6	7	0	5	6
29	0	6	7	0	6	7	0	4	6
30	0	1	7	0	1	7	0	0	4
31	0	5	7	0	5	7	0	2	5
32	3	7	7	3	7	7	3	6	7
33	7	7	7	7	7	7	4	7	7
34	3	7	7	3	7	7	0	6	7
35	7	7	7	7	7	7	5	7	7
36	7	7	7	7	7	7	0	7	7
37	3	7	7	3	7	7	0	7	7
38	0	6	7	0	6	7	0	2	7
39	0	5	7	0	5	7	0	0	7
40	0	5	7	0	5	7	0	0	6
41	0	6	7	0	6	7	0	1	7
42	6	7	7	6	7	7	0	7	7
43	0	6	7	0	6	7	0	5	7
44	2	5	7	2	5	7	1	2	5
45	0	2	7	0	2	6	0	2	6
46	0	1	7	0	1	7	0	0	5
47	2	3	6	2	3	6	0	2	3
48	4	6	7	4	6	7	0	5	6
49	7	7	7	7	7	7	5	7	7
50	6	7	7	6	7	7	1	7	7
51	1	7	7	1	7	7	0	4	7
52	0	7	7	0	7	7	0	2	7

Table 7.3 Weekly available soil workdays for Winton soil series for three soil workability criteria and probability levels.

Week No.	80: 100	80: 105	80: 110	90: 100	90: 105	90: 110	100: 100	100: 105	100: 110
	Probability levels, %								
	80			90			100		
	Soil workability criteria, % of FC								
	100	105	110	100	105	110	100	105	110
01	0	6	7	0	5	7	0	4	7
02	0	0	7	0	0	7	0	0	7
03	0	0	7	0	0	7	0	0	7
04	0	0	7	0	0	7	0	0	7
05	0	1	7	0	0	7	0	0	7
06	0	0	7	0	0	7	0	0	7
07	0	1	7	0	1	7	0	0	7
08	0	6	7	0	3	7	0	1	7
09	0	6	7	0	3	7	0	1	7
10	0	4	7	0	1	7	0	0	7
11	0	4	7	0	1	7	0	1	7
12	0	7	7	0	2	7	0	0	7
13	0	4	7	0	0	7	0	0	7
14	0	5	7	0	2	7	0	1	7
15	0	3	7	0	3	7	0	1	7
16	0	5	7	0	4	7	0	3	7
17	0	3	7	0	2	7	0	0	7
18	0	0	7	0	0	7	0	0	7
19	0	0	7	0	0	7	0	0	7
20	0	4	7	0	1	7	0	0	7
21	0	5	7	0	1	7	0	0	7
22	0	6	7	0	5	7	0	2	7
23	0	6	7	0	2	7	0	0	7
24	0	6	7	0	4	7	0	1	7
25	0	7	7	0	5	7	0	4	7
26	0	7	7	0	7	7	0	7	7
27	0	7	7	0	7	7	0	6	7
28	0	6	7	0	4	7	0	2	7
29	0	6	7	0	6	7	0	6	7
30	0	4	7	0	3	7	0	1	7
31	0	5	7	0	3	7	0	0	7
32	0	6	7	0	3	7	0	2	7
33	0	5	7	0	4	7	0	2	7
34	0	6	7	0	6	7	0	5	7
35	0	7	7	0	7	7	0	5	7
36	0	7	7	0	5	7	0	4	7
37	0	5	7	0	4	7	0	2	7
38	0	5	7	0	3	7	0	0	7
39	0	2	7	0	0	7	0	0	7
40	0	1	7	0	1	7	0	0	7
41	0	5	7	0	3	7	0	1	7
42	0	1	7	0	0	7	0	0	7
43	0	4	7	0	1	7	0	0	7
44	0	1	7	0	0	7	0	0	7
45	0	1	7	0	1	7	0	1	7
46	0	2	7	0	1	7	0	0	7
47	0	1	7	0	1	7	0	1	7
48	0	2	7	0	1	7	0	1	7
49	0	4	7	0	1	7	0	0	7
50	0	5	7	0	5	7	0	2	7
51	0	5	7	0	4	7	0	2	7
52	0	7	7	0	7	7	0	6	7

Table 7.4a Input data information:

2-WD tractor and plough specifications;

Tr. no.	Tyre dimensions front (in)	Tyre dimensions rear (in)	Tyre pressure front (kPa)	Tyre pressure rear (kPa)	tractor load distribution front (%)	tractor load distribution front (kN)	tractor load distribution rear (kN)	Tractor used (h/yr)	Plough Bodies	Plough angle (rad)	Machine age, yr Purchase	Machine age, yr Present	Machine age, yr Sale
2	7.5-17.0	12.4-36.0	130.0	170.0	35.00	8.22	15.26	1000.0	3	0.62	0	5	5
3	7.5-16.5	13.6-38.0	130.0	80.0	35.00	6.62	12.29	1000.0	3	0.62	0	5	5
4	7.5-18.0	13.6-38.0	110.0	160.0	35.00	9.73	18.08	1000.0	3	0.62	0	5	5
5	7.5-18.5	16.9-30.0	120.0	80.0	35.00	8.47	15.72	1000.0	3	0.62	0	5	5
6	7.5-19.5	16.9-30.0	110.0	130.0	35.00	11.01	20.45	1000.0	4	0.62	0	5	5
7	7.5-20.0	16.9-34.0	120.0	80.0	35.00	8.99	16.70	1000.0	3	0.62	0	5	5
8	7.5-20.4	16.9-34.0	120.0	130.0	35.00	11.75	21.82	1000.0	4	0.62	0	5	5
9	7.5-20.8	18.4-30.0	90.0	110.0	35.00	12.13	22.53	1000.0	5	0.62	0	5	5
10	7.5-21.4	18.4-30.0	110.0	140.0	35.00	14.02	26.04	1000.0	5	0.62	0	5	5
11	8.0-20.8	18.4-38.0	90.0	110.0	40.00	17.23	25.85	1000.0	5	0.62	0	5	5
12	8.0-22.4	18.4-38.0	90.0	140.0	40.00	19.85	29.77	1000.0	5	0.62	0	5	5

Cultivator specifications;

no of (blades/tines)/m	25
min. cult width (m)	1.50
max. cult. width (m)	4.75
inc. cult. width (m)	0.50
min. cult. speed (km/h)	4.00
max. cult. speed (km/h)	9.00
inc. cult. speed (km/h)	0.50
cultivation depth (m)	0.20
purchase age (yr)	0
present age (yr)	5
sale age (yr)	5

Soil specifications:

soil name	WINTON
field capacity (mm)	130.00
moisture content (%w/w)	27.15
dry bulk density (kN/m3)	1.43
soil workability (%)	110
cohesive parameter	3.61639
frictional parameter	0.00663
clay ratio	0.2385

Operating conditions;

plough start day no	267
expect finish plough day	287
start ploun week no	39
expect finish week no	41
field efficiency (%)	80
probability level (%)	90
area (ha)	200.00
min. plough speed (km/h)	4.00
max. plough speed (km/h)	8.00
inc. plough speed (km/h)	0.50
min. plough cut depth(m)	0.20
max. plough cut depth(m)	0.20
inc. plough cut depth(m)	0.05

Drill specifications;

min. no. of coulters	20
max. no. of coulters	55
inc. no. of coulters	5
min. coulter space (m)	0.10
max. coulter space (m)	0.1000
inc. coulter space (m)	0.0500
drilling depth (m)	0.15
min. drill speed (km/h)	5.00
max. drill speed (km/h)	5.00
inc. drill speed (km/h)	0.50
purchase age (yr)	0
present age (yr)	5
sale age (yr)	5

Operational costs;

loan interest rate	0.11
investement rate	0.08
tax rate	0.30
inflation rate	0.05
fuel cost ($/L)	0.25
labour cost ($/h)	5.00
tractor shelter rate	0.01
implement shelter rate	0.01
tractor road tax ($/yr)	15.00
crop name	WWHEAT
crop value ($/t)	100.00
optimum sowing day no.	296
max optimum yield(t/ha)	6.20
early loss coefficient	0.00444
late loss coefficient	0.00435

Table 7.4b Input data information:

4-WD (unequal) tractor and plough specifications;

Tr. no.	Tyre dimensions front (in)	Tyre dimensions rear (in)	Tyre pressure front (kPa)	Tyre pressure rear (kPa)	tractor load distribution front (%)	tractor load distribution front (kN)	tractor load distribution rear (kN)	Tractor used (h/yr)	Plough Bodies	Plough angle (rad)	Machine age, yr Purchase	Machine age, yr Present	Machine age, yr Sale
1	11.1-28.0	12.4-28.0	170.0	170.0	42.00	10.56	14.58	1000.0	5	0.62	0	5	5
2	11.2-28.0	16.9-34.0	80.0	80.0	42.00	8.40	11.61	1000.0	5	0.62	0	5	5
3	12.4-28.0	14.9-30.0	160.0	160.0	42.00	12.29	16.97	1000.0	6	0.62	0	5	5
4	12.4-28.0	18.4-34.0	80.0	80.0	42.00	10.58	14.62	1000.0	6	0.62	0	5	5
5	12.4-28.0	18.4-30.0	130.0	130.0	42.00	14.04	19.39	1000.0	7	0.62	0	5	5
6	12.4-28.0	16.9-38.0	80.0	80.0	42.00	11.29	15.60	1000.0	6	0.62	0	5	5
7	13.6-28.0	18.4-38.0	130.0	130.0	42.00	15.04	20.77	1000.0	7	0.62	0	5	5
8	12.4-28.0	15.5-38.0	110.0	110.0	42.00	15.59	21.52	1000.0	8	0.62	0	5	5
9	14.9-28.0	18.4-34.0	140.0	140.0	42.00	18.13	25.03	1000.0	8	0.62	0	5	5
10	14.9-28.0	23.1-26.0	110.0	110.0	42.00	17.84	24.66	1000.0	8	0.62	0	5	5

Cultivator specifications;

no of (blades/tines)/m	25
min. cult width (m)	1.50
max. cult. width (m)	4.75
inc. cult. width (m)	0.50
min. cult. speed (km/h)	4.00
max. cult. speed (km/h)	9.00
inc. cult. speed (km/h)	0.50
cultivation depth (m)	0.20
purchase age (yr)	0
present age (yr)	5
sale age (yr)	5

Soil specifications;

soil name	VINTON
field capacity (mm)	130.00
moisture content (%w/w)	27.15
dry bulk density (kN/m3)	1.43
soil workability (%)	110
cohesive parameter	3.61639
frictional parameter	0.00663
clay ratio	0.2385

Operating conditions;

plough start day no	267
expect finish plough day	287
start ploun week no	39
expect finish week no	41
field efficiency (%)	80
probability level (%)	90
area (ha)	200.00
min. plough speed (km/h)	4.00
max. plough speed (km/h)	8.00
inc. plough speed (km/h)	0.50
min. plough cut depth(m)	0.20
max. plough cut depth(m)	0.20
inc. plough cut depth(m)	0.05

Drill specifications;

min. no. of coulters	20
max. no. of coulters	55
inc. no. of coulters	5
min. coulter space (m)	0.10
max. coulter space (m)	0.1000
inc. coulter space (m)	0.0500
drilling depth (m)	0.15
min. drill speed (km/h)	5.00
max. drill speed (km/h)	5.00
inc. drill speed (km/h)	0.50
purchase age (yr)	0
present age (yr)	5
sale age (yr)	5

Operational costs;

loan interest rate	0.11
investement rate	0.08
tax rate	0.30
inflation rate	0.05
fuel cost (S/L)	0.25
labour cost (S/h)	5.00
tractor shelter rate	0.01
implement shelter rate	0.01
tractor road tax (S/yr)	15.00
crop name	WWHEAT
crop value (S/t)	100.00
optimum sowing day no.	296
max optimum yield(t/ha)	6.20
early loss coefficient	0.00444
late loss coefficient	0.00435

Table 7.4c Input data information;

4-WD (equal) tractor and plough specifications;

Tr. no.	Tyre dimensions front (in)	Tyre dimensions rear (in)	Tyre pressure front (kPa)	Tyre pressure rear (kPa)	Tractor load distribution front (%)	Tractor load distribution front (kN)	Tractor load distribution rear (kN)	Tractor used (h/yr)	Plough bodies	Plough angle (rad)	Machine age/yr Purchase	Machine age/yr Present	Machine age/yr Sale
1	11.2-28.0	11.2-28.0	80.0	80.0	60.00	11.69	7.79	1000.0	5	29°0	0	5	5
2	12.4-28.0	12.4-28.0	170.0	170.0	60.00	17.41	11.61	1000.0	6	29°0	0	5	5
3	13.6-36.0	13.6-36.0	80.0	80.0	60.00	13.84	9.23	1000.0	6	29°0	0	5	5
4	13.6-36.0	13.6-36.0	160.0	160.0	60.00	20.35	13.57	1000.0	7	29°0	0	5	5
5	15.5-38.0	15.5-38.0	80.0	80.0	60.00	17.53	11.68	1000.0	7	29°0	0	5	5
6	15.5-38.0	15.5-38.0	130.0	130.0	60.00	23.33	15.55	1000.0	8	29°0	0	5	5
7	16.9-34.0	16.9-34.0	80.0	80.0	60.00	18.27	12.18	1000.0	8	0.62	0	5	5
8	16.9-34.0	16.9-34.0	130.0	130.0	60.00	24.98	16.65	1000.0	8	0.62	0	5	5
9	13.4-30.0	13.4-30.0	110.0	110.0	60.00	26.39	17.59	1000.0	8	0.62	0	5	5

Cultivator specifications;

no of (blades/tines)/m		25
min. cult width	(m)	1.50
max. cult. width	(m)	4.75
inc. cult. width	(m)	0.50
min. cult. speed	(km/h)	4.00
max. cult. speed	(km/h)	9.00
inc. cult. speed	(km/h)	0.50
cultivation depth	(m)	0.20
purchase age	(yr)	0
present age	(yr)	5
sale age	(yr)	5

Drill specifications;

min. no. of coulters		20
max. no. of coulters		55
inc. no. of coulters		5
min. coulter space	(m)	0.10
max. coulter space	(m)	0.1000
inc. coulter space	(m)	0.0500
drilling depth	(m)	0.15
min. drill speed	(km/h)	5.00
max. drill speed	(km/h)	5.00
inc. drill speed	(km/h)	0.50
purchase age	(yr)	0
present age	(yr)	5
sale age	(yr)	5

Soil specifications;

soil name		WINTON
field capacity	(mm)	130.00
moisture content	(%w/w)	27.15
dry bulk density	(kN/m3)	1.43
soil workability	(%)	.110
cohesive parameter		3.61639
frictional parameter		0.00063
clay ratio		0.2385

Operational costs;

loan interest rate		0.11
investement rate		0.08
tax rate		0.30
inflation rate		0.05
fuel cost	($/l)	0.25
labour cost	($/h)	5.00
tractor shelter rate		0.01
implement shelter rate		0.01
tractor road tax	($/yr)	15.00
crop name		WWHEAT
crop value	($/t)	100.00
optimum sowing day no.		296
max optimum yield	(t/ha)	6.20
early loss coefficient		0.00444
late loss coefficient		0.00435

Operating conditions;

plough start day no		267
expect finish plough day		287
start plough week no		39
expect finish week no		41
field efficiency	(%)	80
probability level	(%)	90
area	(ha)	200.00
min. plough speed	(km/h)	4.00
max. plough speed	(km/h)	8.00
inc. plough speed	(km/h)	0.50
min. plough cut depth	(m)	0.20
max. plough cut depth	(m)	0.20
inc. plough cut depth	(m)	0.05

Table 8.1 Number of days available for field operations at varying probablility levels and soil workability criteria in four quarters for Darvel, Macmerry and Winton soil series at Bush Estate near Edinburgh.

Workability criterion, % of FC	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	Probability level, %											
	80	90	100	80	90	100	80	90	100	80	90	100
	Darvel soil											
100	27	12	1	56	41	20	70	56	37	46	27	10
105	91	91	88	91	91	91	90	90	90	91	91	91
110	91	91	91	91	91	91	91	91	91	91	91	91
	Macmerry soil											
100	12	12	1	2	2	0	33	33	12	28	28	7
105	65	65	28	54	54	14	77	77	55	69	69	44
110	89	89	81	88	88	77	91	91	84	90	89	80
	Winton soil											
100	0	0	0	0	0	0	0	0	0	0	0	0
105	39	16	7	57	36	19	71	55	35	39	26	16
110	91	91	91	91	91	91	91	91	91	91	91	91

Table 8.2 Recommended load/tyre dimensions input data for 2-wheel drive, 4-wheel drive (unequal) and 4-wheel drive (equal) tractors, (Dwyer et al.,1975).

Tyre load, kg	Inflation pressure, kPa	Tyre size, in			
		2-wheel drive	4-wheel drive (unequal)		4-wheel drive (equal)
			front	rear	
1180	80	12.4-36			11.2-28
1703	170	14.4-36	11.1-28	12.4-28	12.4-28
1400	80	13.6-38	11.2-28	16.9-34	13.6-36
1990	160	13.6-38	12.4-38	14.9-30	13.6-36
1750	80	16.9-30	12.2-28	18.4-34	15.5-38
2280	130	16.9-30	12.4-24	18.4-30	15.5-38
1850	80	16.9-34	12.4-32	16.9-38	16.9-34
2420	130	16.9-34	13.6-36	18.4-38	16.9-34
2540	110	18.4-30	12.4-24	15.5-38	18.4-30
2898	140	18.4-30	14.9-30	18.4-34	18.4-30
2860	110	18.4-38	14.9-28	23.1-26	18.4-38
3260	140	18.4-38	16.9-34	18.4-38	18.4-38
3260	140		11.2-28	23.1-26	23.1-26

Table 5.3 Predicted performance parameters for optional tyres for 2-wheel drive tractors.

Power (kW)		Tyre size (in)	Tyre dimension b (m)	n (m)	D (m)	d (m)	Traction parameter CTmax	CT	K	CRR	TE	Axle load W (kN)	Pressure P (kPa)	Mobility no.
31	F	7.5-16.5	0.19	0.14	0.70	0.03					75.0	12.6	130.0	
	R	13.6-38.0	0.34	0.26	1.48	0.05	0.746	0.412	7.99	0.064		29.7	80.0	18.49
37	F	7.5-17.0	0.19	0.14	0.72	0.03					73.8	15.5	130.0	
	R	12.4-36.0	0.31	0.24	1.39	0.05	0.726	0.403	7.77	0.071		35.8	170.0	13.08
38	F	7.5-18.5	0.19	0.14	0.76	0.03					74.8	16.1	120.0	
	R	16.9-30.0	0.43	0.32	1.41	0.06	0.742	0.409	7.92	0.066		36.7	80.0	17.05
40	F	7.5-17.0	0.19	0.14	0.72	0.03					73.8	15.5	130.0	
	R	12.4-36.0	0.31	0.24	1.39	0.05	0.726	0.403	7.77	0.071		35.8	170.0	13.08
40	F	7.5-20.0	0.19	0.14	0.79	0.03					74.8	17.0	120.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.743	0.410	7.94	0.065		38.8	80.0	17.40
41	F	7.5-18.5	0.19	0.14	0.76	0.03					74.8	16.1	120.0	
	R	16.9-30.0	0.43	0.32	1.41	0.06	0.742	0.409	7.92	0.066		36.7	80.0	17.05
42	F	7.5-17.0	0.19	0.14	0.72	0.03					73.8	15.5	130.0	
	R	12.4-36.0	0.31	0.24	1.39	0.05	0.726	0.403	7.77	0.071		35.8	170.0	13.08
43	F	7.5-18.0	0.19	0.14	0.74	0.03					73.8	17.9	110.0	
	R	13.6-38.0	0.34	0.26	1.48	0.05	0.725	0.403	7.76	0.071		42.2	160.0	13.00
43	F	7.5-18.5	0.19	0.14	0.76	0.03					74.8	16.1	120.0	
	R	16.9-30.0	0.43	0.32	1.41	0.06	0.742	0.409	7.92	0.066		36.7	80.0	17.05
43	F	7.5-20.0	0.19	0.14	0.79	0.03					74.8	17.0	120.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.743	0.410	7.94	0.065		38.8	80.0	17.46
45	F	7.5-20.0	0.19	0.14	0.79	0.03					74.8	17.0	120.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.743	0.410	7.94	0.065		38.8	80.0	17.46
47	F	7.5-18.0	0.19	0.14	0.74	0.03					73.8	17.9	110.0	
	R	13.6-38.0	0.34	0.26	1.48	0.05	0.725	0.403	7.76	0.071		42.2	160.0	13.00
48	F	7.5-19.5	0.19	0.14	0.78	0.03					73.8	20.8	110.0	
	R	16.9-30.0	0.43	0.32	1.41	0.06	0.725	0.403	7.77	0.071		48.0	130.0	13.04
49	F	7.5-18.0	0.19	0.14	0.74	0.03					73.8	18.3	110.0	
	R	13.6-38.0	0.34	0.26	1.48	0.05	0.726	0.403	7.77	0.071		41.7	160.0	13.15
50	F	7.5-18.0	0.19	0.14	0.74	0.03					73.8	17.9	110.0	
	R	13.6-38.0	0.34	0.26	1.48	0.05	0.725	0.403	7.76	0.071		42.2	160.0	13.00
52	F	7.5-20.4	0.19	0.14	0.80	0.03					73.9	22.1	140.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.727	0.404	7.77	0.071		50.9	130.0	13.30
53	F	7.5-19.5	0.19	0.14	0.78	0.03					73.8	20.8	110.0	
	R	16.9-30.0	0.43	0.32	1.41	0.06	0.725	0.403	7.77	0.071		48.0	130.0	13.04
53	F	7.5-20.4	0.19	0.14	0.80	0.03					73.8	21.7	140.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.726	0.403	7.77	0.071		51.4	130.0	13.18
54	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	23.3	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.404	7.77	0.071		53.3	110.0	13.22
55	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	22.9	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.403	7.77	0.071		53.8	110.0	3.11
56	F	7.5-20.4	0.19	0.14	0.80	0.03					73.9	22.1	140.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.727	0.404	7.77	0.071		50.9	130.0	13.30
58	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	23.3	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.404	7.77	0.071		53.3	110.0	13.22
59	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	22.9	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.403	7.77	0.071		53.8	110.0	13.11
60	F	7.5-20.4	0.19	0.14	0.80	0.03					73.9	22.1	140.0	
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.727	0.404	7.77	0.071		50.9	130.0	13.30
62	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	23.3	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.404	7.77	0.071		53.3	110.0	13.22
63	F	7.5-20.8	0.19	0.14	0.81	0.03					73.8	22.9	130.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.726	0.403	7.77	0.071		53.3	110.0	13.11
64	F	8.0-20.8	0.20	0.15	0.83	0.03					73.9	32.7	140.0	
	R	18.4-38.0	0.47	0.35	1.07	0.07	0.727	0.404	7.78	0.070		60.8	110.0	13.42
67	F	7.5-21.4	0.19	0.14	0.83	0.03					73.2	26.3	150.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.716	0.402	7.74	0.074		61.1	140.0	11.53
68	F	8.0-20.8	0.20	0.15	0.83	0.03					73.9	32.7	140.0	
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.727	0.404	7.78	0.070		60.3	110.0	13.42
71	F	7.5-21.4	0.19	0.14	0.83	0.03					73.2	26.3	150.0	
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.716	0.402	7.74	0.074		61.1	140.0	11.53
72	F	8.0-22.4	0.20	0.15	0.87	0.03					73.3	37.5	95.0	
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.718	0.402	7.74	0.073		69.1	140.0	11.81
73	F	8.0-22.4	0.20	0.15	0.87	0.03					73.3	36.9	95.0	
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.717	0.402	7.74	0.073		69.6	140.0	11.72
77	F	8.0-22.4	0.20	0.15	0.87	0.03					73.3	37.5	95.0	
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.718	0.402	7.74	0.073		69.1	140.0	11.81
78	F	8.0-22.4	0.20	0.15	0.87	0.03					73.3	36.9	95.0	
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.717	0.402	7.74	0.073		69.6	140.0	11.72

Axle load = Dynamic axle load,
F = Front wheel,

Table 8.4 Single 2-WD tractor-plough combinations with implement work rate, maximum, actual and theoretical pull and tractor power (soil series Winton).

Ref no.	Plough: Bodies	Plough: Width (m)	Plough: Depth (m)	Plough: Speed (km/h)	Plough: Work rate (ha/h)	Dynamic axle load: Front (kN)	Dynamic axle load: Rear (kN)	Slip (%)	Pull: Actual (kN)	Pull: Theor (kN)	Draw bar power (kW)	P.T.O power (kW)	Tractor power (kW)
61	3	0.25	0.20	6.27	0.38	15.55	35.84	10.45	13.30	18.17	23.15	32.68	37
62	3	0.25	0.20	6.72	0.40	15.55	35.84	10.45	13.30	18.17	24.81	35.01	40
63	3	0.25	0.20	7.16	0.43	15.55	35.84	10.45	13.30	18.17	26.46	37.35	42
115	3	0.25	0.20	6.30	0.38	12.58	29.67	10.03	11.33	15.00	19.83	27.53	31
171	3	0.25	0.20	7.16	0.43	18.33	41.72	10.45	15.39	21.24	30.62	43.21	49
173	4	0.25	0.20	6.27	0.50	17.87	42.18	10.46	15.62	21.41	27.19	38.39	44
179	4	0.25	0.20	6.72	0.54	17.87	42.18	10.46	15.62	21.41	29.13	41.14	47
180	4	0.25	0.20	7.16	0.57	17.87	42.18	10.46	15.62	21.41	31.07	43.88	50
223	3	0.25	0.20	6.29	0.38	16.10	36.71	10.11	13.80	18.64	24.12	33.60	38
224	3	0.25	0.20	6.74	0.40	16.10	36.71	10.11	13.80	18.64	25.84	36.00	41
225	3	0.25	0.20	7.19	0.43	16.10	36.71	10.11	13.80	18.64	27.57	38.40	44
285	4	0.25	0.20	6.27	0.50	20.81	47.99	10.46	17.63	24.49	30.70	43.34	49
287	4	0.25	0.20	6.72	0.54	20.81	47.99	10.46	17.63	24.49	32.89	46.43	53
283	4	0.25	0.20	7.16	0.57	20.81	47.99	10.46	17.63	24.49	35.08	49.53	56
331	3	0.25	0.20	6.29	0.38	17.04	38.78	10.09	14.58	19.74	25.49	35.47	40
332	3	0.25	0.20	6.74	0.40	17.04	38.78	10.09	14.58	19.74	27.31	38.00	43
333	3	0.25	0.20	7.19	0.43	17.04	38.78	10.09	14.58	19.74	29.13	40.54	46
394	4	0.25	0.20	6.27	0.50	22.12	50.90	10.43	18.70	25.99	32.57	45.94	52
395	4	0.25	0.20	6.72	0.54	22.12	50.90	10.43	18.70	25.99	34.90	49.22	56
396	4	0.25	0.20	7.17	0.57	22.12	50.90	10.43	18.70	25.99	37.23	52.50	60
403	5	0.25	0.20	6.27	0.63	21.66	51.37	10.44	18.94	26.16	32.98	46.53	53
443	4	0.25	0.20	6.27	0.50	23.35	53.30	10.44	19.52	27.27	33.99	47.95	55
447	4	0.25	0.20	6.72	0.54	23.35	53.30	10.44	19.52	27.27	36.42	51.37	59
450	4	0.25	0.20	7.16	0.57	23.35	53.30	10.44	19.52	27.27	38.84	54.80	62
457	5	0.25	0.20	6.27	0.63	22.88	53.76	10.45	19.75	27.44	34.40	48.55	55
458	5	0.25	0.20	6.72	0.67	22.88	53.76	10.45	19.75	27.44	36.85	52.01	59
459	5	0.25	0.20	7.16	0.72	22.88	53.76	10.45	19.75	27.44	39.31	55.48	63
511	5	0.25	0.20	6.25	0.63	26.34	61.11	10.65	22.21	31.44	38.59	54.89	63
512	5	0.25	0.20	6.70	0.67	26.34	61.11	10.65	22.21	31.44	41.35	58.81	67
513	5	0.25	0.20	7.15	0.71	26.34	61.11	10.65	22.21	31.44	44.10	62.73	72
520	6	0.25	0.20	6.25	0.75	25.88	61.57	10.66	22.45	31.60	39.00	55.51	63
555	5	0.25	0.20	6.72	0.67	32.53	60.96	10.42	21.46	32.07	40.05	56.46	64
567	5	0.25	0.20	7.17	0.72	32.53	60.96	10.42	21.46	32.07	42.72	60.22	69
620	5	0.25	0.20	6.70	0.67	37.31	69.26	10.61	23.97	36.82	44.64	63.41	72
621	5	0.25	0.20	7.15	0.72	37.31	69.26	10.61	23.97	36.82	47.62	67.64	77
629	6	0.25	0.20	6.70	0.80	36.78	69.79	10.62	24.26	36.99	45.18	64.20	73
630	6	0.25	0.20	7.15	0.86	36.78	69.79	10.62	24.26	36.99	48.19	68.48	78

Table 8.5 Summary of costing routine output for 2-WD tractors.

Sale age (Yr)	Power (kW)	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+i)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum interest charge ($)	Balancing charge ($)	Present annual cost ($)
5	31	7928.4	2145.2	0.972	2253.7	300.7	3024.2	8565.1	5036.3	2334.6	777.7	1373.7
5	37	9075.4	2455.5	0.972	2579.8	332.1	3461.7	9804.3	5764.9	2672.4	890.2	1570.6
5	38	9266.6	2507.3	0.972	2634.1	337.4	3534.6	10010.8	5886.4	2728.7	909.0	1603.5
5	40	9649.0	2610.7	0.972	2742.8	347.5	3680.5	10423.9	6129.3	2841.3	946.5	1609.0
5	41	9840.2	2662.5	0.972	2797.2	352.5	3753.4	10630.4	6250.7	2897.6	965.3	1701.8
5	42	10031.3	2714.2	0.972	2851.5	357.5	3826.3	10836.9	6372.1	2953.9	984.0	1734.6
5	43	10222.5	2765.9	0.972	2905.8	362.5	3899.2	11043.5	6493.6	3010.2	1002.8	1767.4
5	44	10413.7	2817.6	0.972	2960.2	367.5	3972.2	11250.0	6615.0	3066.5	1021.5	1800.2
5	46	10796.1	2921.1	0.972	3068.9	377.5	4118.0	11663.1	6857.9	3179.1	1059.0	1865.7
5	47	10987.2	2972.8	0.972	3123.2	382.5	4190.9	11869.6	6979.3	3235.4	1077.8	1898.5
5	49	11369.6	3076.3	0.972	3231.9	392.5	4336.8	12282.7	7222.2	3348.0	1115.3	1964.1
5	50	11560.8	3128.0	0.972	3286.3	397.3	4409.7	12489.2	7343.7	3404.3	1134.0	1996.8
5	52	11943.1	3231.5	0.972	3394.9	407.0	4555.6	12902.3	7586.6	3516.8	1171.6	2062.4
5	53	12134.3	3283.2	0.972	3449.3	411.8	4628.5	13108.8	7708.0	3573.1	1190.3	2095.1
5	55	12516.7	3386.6	0.972	3558.0	421.4	4774.3	13521.9	7950.9	3685.7	1227.8	2160.6
5	56	12707.9	3438.4	0.972	3612.3	426.2	4847.2	13728.4	8072.3	3742.0	1246.6	2193.4
5	59	13281.4	3593.6	0.972	3775.4	440.6	5066.0	14348.0	8436.7	3910.9	1302.8	2291.6
5	60	13472.6	3645.3	0.972	3829.7	445.4	5138.9	14554.5	8558.1	3967.2	1321.6	2324.4
5	62	13854.9	3748.7	0.972	3938.4	455.0	5284.8	14967.6	8801.0	4079.8	1359.1	2389.9
5	63	14046.1	3800.5	0.972	3992.7	459.7	5357.7	15174.2	8922.4	4136.1	1377.8	2422.6
5	64	14237.3	3852.2	0.972	4047.1	464.3	5430.6	15380.7	9043.9	4192.4	1396.6	2455.3
5	67	14810.8	4007.4	0.972	4210.1	478.3	5649.4	16000.3	9408.2	4361.3	1452.9	2553.5
5	69	15193.2	4110.8	0.972	4318.8	487.7	5795.2	16413.4	9651.1	4473.9	1490.4	2619.0
5	72	15766.7	4266.0	0.972	4481.8	501.6	6014.0	17033.0	10015.4	4642.8	1546.6	2717.2
5	73	15957.9	4317.7	0.972	4536.2	506.3	6086.9	17239.5	10136.8	4699.1	1565.4	2749.9
5	77	16722.6	4524.6	0.972	4753.6	524.9	6378.6	18065.6	10622.6	4924.2	1640.4	2880.8
5	78	16913.8	4576.4	0.972	4807.9	529.6	6451.6	18272.2	10744.0	4980.5	1659.1	2913.6

i = investment interest rate.
g = inflation rate.

Table 8.6 Summary of costing routine output for ploughs.

Sale age (Yr)	Bodies	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+r)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum allowance charge ($)	Balancing charge ($)	Present annual cost ($)
5	3	1322.5	357.8	0.972	34.9	145.1	549.8	1428.8	840.1	389.4	160.6	182.4
5	4	1815.5	491.2	0.972	80.7	146.2	754.8	1961.3	1153.2	534.6	220.5	249.0
5	5	2308.5	624.6	0.972	213.7	154.1	959.7	2493.8	1466.4	679.8	280.3	329.8
5	6	2801.4	758.0	0.972	259.4	167.4	1164.6	3026.4	1779.5	824.9	340.2	397.9

Table 8.7 Summary of costing routine output for cultivators.

Sale age (Yr)	No. of tines (/m)	Machine width (m)	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+r)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum interest charge ($)	Balancing charge ($)	Present annual cost ($)
5	25	1.5	1274.3	344.8	0.972	42.9	115.0	529.8	1376.6	809.5	375.2	154.7	177.8
5	25	2.0	1851.7	501.0	0.972	62.3	116.3	769.8	2000.4	1176.2	545.3	224.9	250.6
5	25	2.5	2398.2	648.9	0.972	80.7	124.6	997.0	2590.8	1523.4	706.2	291.2	320.6
5	25	3.0	2975.6	805.1	0.972	100.1	138.6	1237.1	3214.6	1890.2	876.2	361.3	395.4
5	25	3.5	3522.2	953.0	0.972	118.5	153.1	1464.3	3805.0	2237.4	1037.2	427.7	466.4
5	25	4.0	4099.5	1109.2	0.972	137.9	168.4	1704.3	4428.8	2604.1	1207.2	497.8	541.3
5	25	4.5	4646.1	1257.1	0.972	156.3	182.9	1931.5	5019.2	2951.3	1368.1	564.2	612.3

Table 8.8 Summary of costing routine output for drills.

Sale age (Yr)	No. of coulters	Machine width (m)	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+r)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum interest charge ($)	Balancing charge ($)	Present annual cost ($)
5	20	2.0	907.9	245.6	0.972	72.1	115.0	377.4	980.8	576.7	267.3	110.2	138.0
5	25	2.5	1689.7	457.2	0.972	134.1	115.1	702.5	1825.4	1073.3	497.6	205.2	241.8
5	30	3.0	2471.5	668.7	0.972	196.2	126.2	1027.5	2670.0	1569.9	727.8	300.1	347.3
5	35	3.5	3253.3	880.2	0.972	258.2	146.0	1352.5	3514.5	2066.6	958.0	395.1	454.1
5	40	4.0	4035.1	1091.8	0.972	320.3	166.7	1677.5	4359.1	2563.2	1188.2	490.0	561.0
5	45	4.5	4816.9	1303.3	0.972	382.3	187.4	2002.5	5203.7	3059.8	1418.4	584.9	668.0
5	50	5.0	5598.7	1514.8	0.972	444.4	208.1	2327.5	6048.3	3556.4	1648.6	679.9	774.9
5	55	5.5	6380.5	1726.4	0.972	506.5	228.9	2652.6	6892.9	4053.0	1878.8	774.8	881.9

Table 8.9 Performance of 2-WD tractors and utilisation of multiple combinations selected for a 100 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate + (ha/h)	Performance: Cult. work rate * (ha/h)	Performance: Drill work rate @ (ha/h)	Yield loss value ($)
1	3	0.09	0.23	0.32	0.14	88.63	232.65	139.59	1.13	0.43	0.72	207.36
2	3	0.08	0.17	0.26	0.11	82.72	174.49	111.67	1.21	0.57	0.89	73.11
3	3	0.08	0.14	0.22	0.09	77.55	139.59	93.06	1.29	0.72	1.08	62.32
4	3	0.09	0.12	0.20	0.08	88.21	115.78	79.39	1.13	0.86	1.26	58.73
5	3	0.08	0.10	0.18	0.07	77.54	99.70	69.79	1.29	1.00	1.43	58.73
6	2	0.10	0.09	0.19	0.06	99.72	87.25	62.05	1.00	1.15	1.61	58.73
7	2	0.09	0.08	0.17	0.06	93.07	77.56	55.84	1.07	1.29	1.79	58.73
8	2	0.09	0.21	0.29	0.05	87.25	206.82	50.77	1.15	0.48	1.97	58.73
9	3	0.09	0.16	0.24	0.14	88.30	154.52	139.07	1.13	0.65	0.72	207.36
10	3	0.08	0.12	0.21	0.11	82.41	123.61	111.25	1.21	0.81	0.90	73.11
11	3	0.08	0.10	0.18	0.09	77.26	103.01	92.71	1.29	0.97	1.08	62.32
12	2	0.10	0.09	0.19	0.08	99.71	88.63	79.77	1.00	1.13	1.25	58.73
13	2	0.09	0.08	0.17	0.07	93.07	77.55	69.80	1.07	1.29	1.43	58.73
14	2	0.09	0.07	0.16	0.06	87.25	68.94	62.04	1.15	1.45	1.61	58.73
15	3	0.09	0.19	0.27	0.06	88.27	185.37	55.61	1.13	0.54	1.80	58.73
16	3	0.08	0.14	0.22	0.05	82.39	139.02	50.55	1.21	0.72	1.98	58.73
17	3	0.08	0.11	0.19	0.14	77.24	111.22	139.03	1.29	0.90	0.72	207.36
18	2	0.10	0.09	0.19	0.11	99.68	93.04	111.64	1.00	1.08	0.90	73.11
19	2	0.09	0.08	0.17	0.09	93.04	79.75	93.04	1.07	1.25	1.08	62.32
20	2	0.09	0.07	0.16	0.08	87.22	69.78	79.74	1.15	1.43	1.25	58.73
21	2	0.08	0.06	0.14	0.07	79.76	62.03	69.79	1.25	1.61	1.43	58.73
22	2	0.10	0.17	0.27	0.06	99.69	169.17	62.03	1.00	0.59	1.61	58.73
23	2	0.09	0.13	0.22	0.06	93.04	126.88	55.83	1.07	0.79	1.79	58.73
24	2	0.09	0.10	0.19	0.05	87.23	101.50	50.75	1.15	0.99	1.97	58.73
25	2	0.08	0.09	0.16	0.14	79.76	84.60	139.59	1.25	1.18	0.72	207.36
26	2	0.07	0.07	0.15	0.11	74.45	72.51	111.67	1.34	1.38	0.90	73.11
27	2	0.07	0.06	0.13	0.09	69.79	63.45	93.06	1.43	1.58	1.08	62.32
28	2	0.08	0.06	0.14	0.08	79.94	56.52	79.94	1.25	1.77	1.25	58.73
29	2	0.07	0.16	0.23	0.07	74.61	155.44	69.95	1.34	0.64	1.43	58.73
30	2	0.07	0.12	0.19	0.06	69.95	116.58	62.18	1.43	0.86	1.61	58.73
31	2	0.07	0.09	0.16	0.06	66.63	93.28	55.97	1.50	1.07	1.79	58.73
32	2	0.07	0.08	0.15	0.05	74.42	77.52	50.74	1.34	1.29	1.97	58.73
33	2	0.07	0.07	0.14	0.14	69.77	66.45	139.54	1.43	1.50	0.72	207.36
34	2	0.07	0.06	0.13	0.11	74.58	58.27	111.87	1.34	1.72	0.89	73.11
35	2	0.07	0.05	0.12	0.09	69.92	51.79	93.23	1.43	1.93	1.07	62.32
36	2	0.06	0.14	0.21	0.08	62.16	143.45	79.92	1.61	0.70	1.25	58.73
37	2	0.06	0.11	0.17	0.07	58.27	107.58	69.93	1.72	0.93	1.43	58.73

Tr = Tractors
\+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
@ Drill work rate only using one tractor.

Table 8.10 Performance of 2-WD tractors and utilisation of multiple combinations selected for a 200 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 80% field efficieny together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Cultivation	Tillage	Drilling	Operation use: Ploughing (h)	Cultivation (h)	Drilling (h)	Performance: Plough work rate (ha/h)	Cult. work rate (ha/h)	Drill work rate (ha/h)	Yield loss value (\$)
1	4	0.13	0.47	0.60	0.28	132.94	465.30	279.18	1.50	0.43	0.72	1105.79
2	3	0.17	0.35	0.51	0.22	165.44	348.98	223.35	1.21	0.57	0.89	630.48
3	3	0.16	0.28	0.43	0.19	155.10	279.18	186.12	1.29	0.72	1.08	501.02
4	4	0.13	0.23	0.36	0.16	132.32	231.55	158.78	1.51	0.86	1.26	429.11
5	3	0.16	0.20	0.35	0.14	155.09	199.40	139.58	1.29	1.00	1.43	414.71
6	3	0.13	0.17	0.31	0.12	132.96	174.51	124.09	1.50	1.15	1.61	182.18
7	3	0.12	0.16	0.28	0.11	124.09	155.12	111.68	1.61	1.29	1.79	146.23
8	3	0.12	0.41	0.53	0.10	116.34	413.64	101.53	1.72	0.48	1.97	133.64
9	4	0.13	0.31	0.44	0.28	132.44	309.04	278.13	1.51	0.65	0.72	1105.79
10	3	0.16	0.25	0.41	0.22	164.82	247.23	222.51	1.21	0.81	0.90	630.48
11	3	0.15	0.21	0.36	0.19	154.52	206.02	185.42	1.29	0.97	1.08	501.02
12	3	0.13	0.18	0.31	0.16	132.95	177.27	159.54	1.50	1.13	1.25	429.11
13	3	0.12	0.16	0.28	0.14	124.09	155.11	139.60	1.61	1.29	1.43	414.71
14	3	0.12	0.14	0.25	0.12	116.33	137.87	124.09	1.72	1.45	1.61	182.18
15	4	0.13	0.37	0.50	0.11	132.41	370.73	111.22	1.51	0.54	1.80	146.23
16	3	0.16	0.28	0.44	0.10	164.77	278.05	101.11	1.21	0.72	1.98	133.64
17	3	0.15	0.22	0.38	0.28	154.47	222.44	278.05	1.29	0.90	0.72	1105.79
18	3	0.13	0.19	0.32	0.22	132.91	186.07	223.29	1.50	1.08	0.90	630.48
19	3	0.12	0.16	0.28	0.19	124.05	159.49	186.07	1.61	1.25	1.08	501.02
20	3	0.12	0.14	0.26	0.16	116.29	139.55	159.49	1.72	1.43	1.25	429.1
21	2	0.16	0.12	0.28	0.14	159.51	124.07	139.57	1.25	1.61	1.43	414.7
22	3	0.13	0.34	0.47	0.12	132.92	338.34	124.06	1.50	0.59	1.61	182.1
23	3	0.12	0.25	0.38	0.11	124.06	253.76	111.65	1.61	0.79	1.79	146.2
24	3	0.12	0.20	0.32	0.10	116.31	203.01	101.50	1.72	0.99	1.97	133.6
25	2	0.16	0.17	0.33	0.28	159.53	169.20	279.17	1.25	1.18	0.72	1105.7
26	2	0.15	0.14	0.29	0.22	148.89	145.02	223.34	1.34	1.38	0.90	630.4
27	2	0.14	0.13	0.27	0.19	139.59	126.90	186.11	1.43	1.58	1.08	501.0
28	2	0.16	0.11	0.27	0.16	159.88	113.05	159.88	1.25	1.77	1.25	429.1
29	2	0.15	0.31	0.46	0.14	149.22	310.88	139.90	1.34	0.64	1.43	414.7
30	2	0.14	0.23	0.37	0.12	139.90	233.16	124.35	1.43	0.86	1.61	182.1
31	2	0.13	0.19	0.32	0.11	133.25	186.55	111.93	1.50	1.07	1.79	146.2
32	2	0.15	0.16	0.30	0.10	148.84	155.04	101.48	1.34	1.29	1.97	133.6
33	2	0.14	0.13	0.27	0.28	139.54	132.89	279.08	1.43	1.50	0.72	1105.7
34	2	0.15	0.12	0.27	0.22	149.16	116.53	223.74	1.34	1.72	0.89	630.4
35	2	0.14	0.10	0.24	0.19	139.84	103.58	186.45	1.43	1.93	1.07	501.0
36	2	0.12	0.29	0.41	0.16	124.32	286.89	159.84	1.61	0.70	1.25	429.1
37	2	0.12	0.22	0.33	0.14	116.55	215.17	139.86	1.72	0.93	1.43	414.7

Tr = Tractors
\+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
@ Drill work rate only using one tractor.

Table 8.11 Performance of 2-WD tractors and utilisation of multiple combinations selected for a 300 ha, operation starting at day no. 260 (week 38) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate + (ha/h)	Performance: Cult. work rate * (ha/h)	Performance: Drill work rate @ (ha/h)	Yield loss value ($)
1	4	0.20	0.70	0.90	0.42	199.42	697.95	418.77	1.50	0.43	0.72	3620.45
2	4	0.19	0.52	0.71	0.34	186.12	523.47	335.02	1.61	0.57	0.89	2206.18
3	4	0.17	0.42	0.59	0.28	174.49	418.77	279.18	1.72	0.72	1.08	1658.69
4	4	0.20	0.35	0.55	0.24	198.47	347.33	238.17	1.51	0.86	1.26	1075.17
5	4	0.17	0.30	0.47	0.21	174.47	299.10	209.37	1.72	1.00	1.43	889.08
6	3	0.20	0.26	0.46	0.19	199.43	261.76	186.14	1.50	1.15	1.61	751.53
7	3	0.19	0.23	0.42	0.17	186.14	232.67	167.52	1.61	1.29	1.79	662.53
8	3	0.17	0.62	0.79	0.15	174.51	620.46	152.30	1.72	0.48	1.97	643.66
9	4	0.20	0.46	0.66	0.42	198.67	463.55	417.20	1.51	0.65	0.72	3620.45
10	4	0.19	0.37	0.56	0.33	185.42	370.84	333.76	1.62	0.81	0.90	2206.18
11	4	0.17	0.31	0.48	0.28	173.83	309.04	278.13	1.73	0.97	1.08	1658.69
12	3	0.20	0.27	0.47	0.24	199.43	265.90	239.31	1.50	1.13	1.25	1075.17
13	3	0.19	0.23	0.42	0.21	186.13	232.66	209.40	1.61	1.29	1.43	889.08
14	3	0.17	0.21	0.38	0.19	174.50	206.81	186.13	1.72	1.45	1.61	751.53
15	4	0.20	0.56	0.75	0.17	198.61	556.10	166.83	1.51	0.54	1.80	662.53
16	4	0.19	0.42	0.60	0.15	185.37	417.08	151.66	1.62	0.72	1.98	630.17
17	4	0.17	0.33	0.51	0.42	173.78	333.66	417.08	1.73	0.90	0.72	3620.45
18	3	0.20	0.28	0.48	0.34	199.36	279.11	334.93	1.50	1.08	0.90	2206.18
19	3	0.19	0.24	0.43	0.28	186.07	239.24	279.11	1.61	1.25	1.08	1658.69
20	3	0.17	0.21	0.38	0.24	174.44	209.33	239.23	1.72	1.43	1.25	1075.17
21	3	0.16	0.19	0.35	0.21	159.51	186.10	209.36	1.88	1.61	1.43	889.08
22	3	0.20	0.51	0.71	0.19	199.38	507.52	186.09	1.50	0.59	1.61	751.53
23	3	0.19	0.38	0.57	0.17	186.09	380.64	167.48	1.61	0.79	1.79	662.53
24	3	0.17	0.31	0.48	0.15	174.46	304.51	152.25	1.72	0.99	1.97	643.66
25	3	0.16	0.25	0.41	0.42	159.53	253.79	418.76	1.88	1.18	0.72	3620.45
26	2	0.22	0.22	0.44	0.34	223.34	217.54	335.01	1.34	1.38	0.90	2206.18
27	2	0.21	0.19	0.40	0.28	209.38	190.35	279.17	1.43	1.58	1.08	1658.69
28	3	0.16	0.17	0.33	0.24	159.88	169.57	239.82	1.88	1.77	1.25	1075.17
29	2	0.22	0.47	0.69	0.21	223.83	466.32	209.84	1.34	0.64	1.43	889.08
30	2	0.21	0.35	0.56	0.19	209.84	349.74	186.53	1.43	0.86	1.61	751.53
31	2	0.20	0.28	0.48	0.17	199.88	279.83	167.90	1.50	1.07	1.79	662.53
32	2	0.22	0.23	0.46	0.15	223.26	232.56	152.22	1.34	1.29	1.97	643.66
33	2	0.21	0.20	0.41	0.42	209.31	199.34	418.62	1.43	1.50	0.72	3620.45
34	2	0.22	0.17	0.40	0.34	223.74	174.80	335.62	1.34	1.72	0.89	2206.18
35	2	0.21	0.16	0.37	0.28	209.76	155.38	279.68	1.43	1.93	1.07	1658.69
36	2	0.19	0.43	0.62	0.24	186.48	430.34	239.76	1.61	0.70	1.25	1075.17
37	2	0.17	0.32	0.50	0.21	174.82	322.75	209.79	1.72	0.93	1.43	889.08

Tr = Tractors

+ Plough work rate for tractor fleet

* Cult.=cultivator; work rate only using one tractor

@ Drill work rate only using one tractor.

Table 8.12 2-WD tractor costs in different operations for a period of ownership of 5 years.

Ref no.	Power (kW)	Purchase price ($)	Tractor present cost: Ploughing ($)	Cultivation ($)	Drilling ($)	Tractor repair cost: Ploughing ($)	Cultivation ($)	Drilling ($)	Insurance cost ($)	Tax cost ($)	Shelter cost ($)
1	37	9075.44	208.8	730.8	438.5	177.7	621.8	373.1	66.9	15.0	90.8
2	40	9648.98	276.1	582.5	372.8	235.1	495.8	317.3	70.1	15.0	96.5
3	42	10031.34	269.0	484.3	322.9	229.1	412.4	274.9	72.3	15.0	100.3
4	31	7928.36	181.8	318.1	218.1	154.5	270.3	185.4	60.6	15.0	79.3
5	49	11369.60	304.6	391.6	274.1	259.6	333.8	233.7	79.7	15.0	113.7
6	44	10413.70	239.3	314.1	223.4	203.9	267.6	190.3	74.4	15.0	104.1
7	47	10987.24	235.6	294.5	212.0	200.8	251.0	180.7	77.6	15.0	109.9
8	50	11560.78	232.3	826.0	202.7	198.1	704.2	172.8	80.7	15.0	115.6
9	38	9266.62	212.4	495.5	446.0	180.7	421.7	379.5	68.0	15.0	92.7
10	41	9840.16	280.5	420.7	378.7	238.8	358.2	322.4	71.2	15.0	98.4
11	44	10413.70	278.2	370.9	333.8	236.9	315.9	284.3	74.4	15.0	104.1
12	49	11369.60	261.1	348.2	313.4	222.6	296.8	267.1	79.7	15.0	113.7
13	53	12134.32	260.0	325.0	292.5	221.7	277.2	249.4	83.9	15.0	121.3
14	56	12707.86	255.2	302.4	272.2	217.7	258.0	232.2	87.1	15.0	127.1
15	40	9648.98	221.0	618.8	185.6	188.1	526.8	158.0	70.1	15.0	96.5
16	43	10222.52	291.2	491.4	178.7	248.0	418.5	152.2	73.3	15.0	102.2
17	46	10796.06	288.2	415.0	518.8	245.6	353.6	442.0	76.5	15.0	108.0
18	52	11943.14	274.1	383.7	460.5	233.7	327.2	392.7	82.8	15.0	119.4
19	56	12707.86	272.1	349.8	408.1	232.1	298.4	348.2	87.1	15.0	127.1
20	60	13472.58	270.3	324.4	370.7	230.7	276.9	316.4	91.3	15.0	134.7
21	53	12134.32	334.2	259.9	292.4	285.0	221.7	249.4	83.9	15.0	121.3
22	55	12516.68	287.2	731.0	268.0	245.0	623.6	228.7	86.0	15.0	125.2
23	59	13281.40	284.3	581.5	255.9	242.6	496.3	218.4	90.3	15.0	132.8
24	62	13854.94	278.0	485.2	242.6	237.3	414.2	207.1	93.4	15.0	138.6
25	55	12516.68	344.7	365.6	603.2	294.0	311.8	514.5	86.0	15.0	125.2
26	59	13281.40	341.2	332.3	511.8	291.2	283.6	436.8	90.3	15.0	132.8
27	63	14046.12	338.2	307.4	450.9	288.7	262.5	384.9	94.2	15.0	140.5
28	63	14046.12	387.3	273.9	387.3	330.7	233.8	330.7	94.2	15.0	140.5
29	67	14810.84	381.0	793.8	357.2	325.4	678.0	305.1	97.6	15.0	148.1
30	72	15766.74	380.1	633.5	337.9	324.8	541.3	288.7	101.8	15.0	157.7
31	63	14046.12	322.8	452.0	271.2	275.6	385.9	231.5	94.2	15.0	140.5
32	64	14237.30	365.5	380.7	249.2	312.0	325.0	212.8	95.1	15.0	142.4
33	69	15193.20	365.5	348.0	730.9	312.2	297.3	624.4	99.3	15.0	151.9
34	72	15766.74	405.3	316.6	608.0	346.3	270.6	519.5	101.8	15.0	157.7
35	77	16722.64	402.9	298.4	537.1	344.4	255.1	459.1	106.0	15.0	167.2
36	73	15957.92	341.9	788.9	439.5	292.1	674.2	375.6	102.6	15.0	159.6
37	78	16913.82	339.6	626.9	407.5	290.3	535.9	348.3	106.8	15.0	169.1

* Repair cost only for ploughing operation based on ploughing hours divided by 1000.

Table 7.13 Feasible 2-WD tractor-plough combinations for ploughing a 100 ha operation starting at week 39 and expected to finish at week 40, at 80% field efficiency (soil series Winton).

Single combination no.	223	333	394	396	511	512	513	621
Number tractors	3	3	2	2	2	2	2	2
Tractor specification:								
max. power required (kW)	38	46	52	60	63	67	72	77
P.T.O. power (kW)	33.60	40.54	45.94	52.50	54.89	58.81	62.73	67.64
drawbar power (kW)	24.12	29.13	32.57	37.23	38.59	41.35	44.10	47.62
static weight (kN)	48.38	51.40	67.15	67.15	80.12	80.12	80.12	99.24
dynamic weight (kN)	52.81	55.82	73.02	73.02	87.45	87.45	87.45	106.57
weight/power (kg/kW)	96.90	84.87	98.30	86.02	98.76	92.18	86.42	90.84
dynamic axle load								
front (kN)	16.10	17.04	22.12	22.12	22.94	26.34	37.51	37.51
rear (kN)	36.71	38.78	50.90	50.90	53.81	61.11	69.72	69.12
front tyre dimension (in)	7.5-18.5	7.5-20.0	7.5-20.4	7.5-20.4	7.5-20.8	7.5-20.8	8.0-22.4	8.0-22.4
rear tyre dimension (in)	16.9-30.0	16.9-34.0	16.9-34.0	16.9-34.0	18.4-30.0	18.4-30.0	18.4-38.0	18.4-38.0
front tyre pressure (kPa)	120.00	120.00	140.00	140.00	130.00	150.00	95.00	95.00
rear tyre pressure (kpa)	80.00	80.00	130.00	130.00	110.00	140.00	140.00	140.00
wheel slip (%)	10.11	10.09	10.43	10.43	10.65	10.65	10.65	10.61
actual thrust (kN)	13.80	14.58	18.70	18.70	22.21	22.21	23.97	23.97
front rolling res. (kN)	0.61	0.65	0.92	0.92	1.18	1.18	1.18	1.94
rear rolling res. (kN)	1.21	1.27	1.80	1.80	2.26	2.26	2.26	2.54
maximum thrust (kN)	27.24	28.83	37.00	37.00	43.77	43.77	43.77	49.72
Plough specification:								
bodies	3	3	4	4	5	5	5	5
weight (kN)	4.43	4.43	5.88	5.88	7.33	7.33	7.33	7.33
forward speed (km/h)	6.29	7.19	6.27	7.17	6.25	6.70	7.15	7.15
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.38	0.43	0.50	0.57	0.63	0.67	0.71	0.72
draught (kN)	11.20	11.56	14.92	15.40	18.64	18.93	19.24	19.24
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	267	267	267	267	267	267	267	267
no. of ploughing days	11	9	12	10	9	9	8	8
expected finish day no	280	280	280	280	280	280	280	280
plough finish day no	280	280	280	280	280	280	280	280
plough penalty days	0	0	0	0	0	0	0	0
plough finish week no	40	40	40	40	40	40	40	40
Operational cost: ($)								
tractor purchase price	9266.62	10796.06	11943.14	13472.58	14046.12	14810.84	15760.74	16722.64
plough purchase price	1322.54	1322.54	1815.49	1815.49	2308.46	2308.46	2308.46	2308.46
tractor annual cost	1603.46	1865.74	2062.35	2324.38	2422.62	2553.54	2717.20	2880.85
plough annual cost	179.64	179.64	244.03	244.03	306.55	306.55	306.55	306.55
tractor ann. cost/plough	141.58	144.10	205.58	202.73	193.67	190.52	190.06	201.43
fuel cost	367.76	388.49	567.97	567.46	543.93	544.30	544.94	536.40
labour cost	441.48	386.18	498.41	436.10	399.70	373.06	349.74	349.60
other operating cost	60.64	60.54	71.72	71.09	74.95	74.44	74.19	75.14
Single combination cost ($)	1191.11	1158.95	1587.70	1521.41	1518.80	1488.88	1465.49	1519.13
Total ploughing cost ($)	3573.3	3476.9	3175.4	3042.8	3037.6	2977.8	2931.0	3033.3

Table A.14 Feasible 2-WD tractor-plough combinations for ploughing a 200 ha operation starting at week 39 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	223	333	394	396	511	512	513	621
Number tractors	4	3	3	3	2	2	2	2
Tractor specification:								
max. power required (kW)	38	46	52	60	63	67	72	77
P.T.O. power (kW)	33.60	40.54	45.94	52.50	54.89	58.81	62.73	67.64
drawbar power (kW)	24.12	29.13	32.57	37.23	38.59	41.35	44.10	47.62
static weight (kN)	48.38	51.40	67.15	67.15	80.12	80.12	80.12	99.24
dynamic weight (kN)	52.81	55.82	73.02	73.02	87.45	87.45	87.45	106.57
weight/power (kg/kW)	96.90	84.87	98.30	86.02	98.76	92.18	86.42	90.84
dynamic axle load								
front (kN)	16.10	17.04	22.12	22.12	22.94	26.34	37.51	37.51
rear (kN)	36.71	38.78	50.90	50.90	53.11	61.11	69.12	69.12
front tyre dimension(in)	7.5-18.5	7.5-20.4	7.5-20.4	7.5-20.0	7.5-20.8	7.5-20.8	8.0-22.4	8.0-22.4
rear tyre dimension (in)	16.9-30.0	16.9-34.6	16.9-34.0	16.9-34.0	18.4-30.0	18.4-30.0	18.4-33.0	18.4-30.0
front tyre pressure(kPa)	120.00	120.00	140.00	140.00	130.00	150.00	95.00	95.00
rear tyre pressure (kpa)	80.00	80.00	130.00	130.00	110.00	140.00	140.00	140.00
wheel slip (%)	10.11	10.09	10.43	10.43	10.65	10.65	10.65	10.61
actual thrust (kN)	13.80	14.58	18.70	18.70	22.21	22.21	23.97	23.97
front rolling res. (kN)	0.61	0.65	0.92	0.92	1.18	1.18	1.18	1.94
rear rolling res. (kN)	1.21	1.27	1.80	1.80	2.26	2.26	2.26	2.54
maximum thrust (kN)	27.24	28.83	37.00	37.00	43.77	43.77	43.77	49.72
Plough specification:								
bodies	3	3	4	4	5	5	5	5
weight (kN)	4.43	4.43	5.88	5.88	7.33	7.33	7.33	7.33
forward speed (km/h)	6.29	7.19	6.27	7.17	6.25	6.70	7.15	7.15
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.38	0.43	0.50	0.57	0.63	0.67	0.71	0.72
draught (kN)	11.20	11.56	14.92	15.40	18.64	18.93	19.24	19.24
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	267	267	267	267	267	267	267	267
no. of ploughing days	16	19	16	14	19	18	17	17
expected finish day no	287	287	287	287	287	287	287	287
plough finish day no	287	287	287	287	287	287	287	287
plough penalty days	0	0	0	0	0	0	0	0
plough finish week no	41	41	41	40	41	41	41	41
Operational cost: ($)								
tractor purchase price	9266.62	10796.06	11943.14	13472.58	14046.12	14810.84	15766.74	16722.64
plough purchase price	1322.54	1322.54	1815.49	1815.49	2308.46	2308.46	2303.46	2308.46
tractor annual cost	1603.46	1865.74	2062.35	2324.38	2422.62	2553.54	2717.20	2880.85
plough annual cost	182.41	186.04	249.02	249.02	329.81	329.81	329.81	329.81
tractor ann. cost/plough	212.37	288.21	274.10	270.31	387.33	381.04	380.12	402.86
fuel cost	551.65	776.97	757.29	756.61	1087.86	1088.60	1089.88	1172.80
labour cost	662.22	772.36	664.54	581.47	799.40	746.11	699.48	699.20
other operating cost	68.40	75.94	78.94	78.10	94.91	93.89	93.39	95.30
Single combination cost($)	1677.04	2099.52	2023.89	1935.51	2699.32	2639.46	2592.68	2699.97
Total ploughing cost ($)	6708.2	6298.6	6071.7	5806.5	5398.6	5278.9	5185.4	5399.9

Table 4.15 Feasible 2-WD tractor-plough combinations for ploughing a 300 ha operations starting at week 33 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	223	333	394	396	511	512	513	621
Number tractors	4	4	3	3	3	2	2	2
Tractor specification:								
max. power required (kW)	38	46	52	60	63	67	72	77
P.T.O. power (kW)	33.60	40.54	45.94	52.50	54.89	58.81	62.73	67.64
drawbar power (kW)	24.12	29.13	32.57	37.23	38.59	41.35	44.10	47.62
static weight (kN)	48.38	51.40	67.15	67.15	80.12	80.12	80.12	99.24
dynamic weight (kN)	52.61	55.82	73.02	73.02	87.45	87.45	87.45	105.57
weight/power (kg/kW)	96.90	84.87	98.30	86.02	98.76	92.18	86.42	90.84
dynamic axle load								
front (kN)	16.10	17.04	22.12	22.12	26.94	26.34	37.51	37.51
rear (kN)	36.71	38.78	50.90	50.90	61.11	61.11	69.12	69.12
front tyre dimension (in)	7.5-18.5	7.5-20.4	7.5-20.4	7.5-20.0	7.5-20.8	7.5-20.8	8.0-22.4	8.0-22.4
rear tyre dimension (in)	16.9-30.0	16.9-34.0	16.9-34.0	16.9-34.0	12.4-33.0	12.4-33.0	18.4-38.0	18.4-38.0
front tyre pressure (kPa)	120.00	120.00	140.00	140.00	130.00	150.00	95.00	95.00
rear tyre pressure (kpa)	80.00	80.00	130.00	130.00	110.00	140.00	140.00	140.00
wheel slip (%)	10.11	10.09	10.43	10.43	10.65	10.65	10.65	10.61
actual thrust (kN)	13.80	14.58	18.70	18.70	22.21	22.21	23.97	23.97
front rolling res. (kN)	0.61	0.65	0.92	0.92	1.18	1.18	1.18	1.94
rear rolling res. (kN)	1.21	1.27	1.80	1.80	2.26	2.26	2.26	2.54
maximum thrust (kN)	27.24	28.83	37.00	37.00	43.77	43.77	43.77	49.72
Plough specification:								
bodies	3	3	4	4	5	5	5	5
weight (kN)	4.43	4.43	5.88	5.88	7.33	7.33	7.33	7.33
forward speed (km/h)	6.29	7.19	6.27	7.17	6.25	6.70	7.15	7.15
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.38	0.43	0.50	0.57	0.63	0.67	0.71	0.72
draught (kN)	11.20	11.56	14.92	15.40	18.64	18.93	19.24	19.24
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	260	260	260	260	260	260	260	260
no. of ploughing days	24	21	24	21	19	27	26	26
expected finish day no	287	287	287	287	287	287	287	287
plough finish day no	287	287	287	287	287	287	287	287
plough penalty days	0	0	0	0	0	0	0	0
plough finish week no	41	40	41	40	40	41	41	41
Operational cost: ($)								
tractor purchase price	9266.62	10796.06	11943.14	13472.58	14046.12	14810.84	15766.74	16722.64
plough purchase price	1322.54	1322.54	1815.49	1815.49	2308.46	2308.46	2308.46	2308.46
tractor annual cost	1603.46	1865.74	2062.35	2324.38	2422.62	2553.54	2717.20	2589.85
plough annual cost	188.16	188.16	262.32	262.32	329.81	365.05	365.05	365.05
tractor ann. cost/plough	318.55	324.23	411.16	405.47	387.33	571.57	570.19	604.29
fuel cost	827.47	874.10	1135.94	1134.91	1087.86	1632.90	1634.82	1759.20
labour cost	993.33	868.91	996.81	872.21	799.40	1119.17	1049.22	1048.80
other operating cost	80.03	79.79	93.38	92.11	94.91	113.35	112.59	115.45
Single combination cost ($)	2407.55	2335.19	2899.60	2767.03	2699.32	3802.04	3731.87	3292.79
Total ploughing cost ($)	9630.2	9340.8	8698.8	8301.1	8093.0	7604.1	7463.7	7705.6

Table 8.16 Feasible 2-WD tractor-cultivator combinations for cultivating a 100 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	223	333	394	396	511	512	513	621
Tractor specification:								
max. power required (kW)	38	46	52	60	63	67	72	77
Cultivator specification:								
no. of (blades/tines)/m	25	25	25	25	25	25	25	25
width (m)	2.000	2.500	3.000	3.500	4.000	4.000	4.000	4.500
actual speed (km/h)	4.05	4.50	4.48	4.48	4.48	4.93	5.36	5.36
actual work rate (ha/h)	0.65	0.90	1.08	1.25	1.43	1.58	1.72	1.93
Operating condition:								
start week no	41	41	41	41	41	41	41	41
start day no	281	281	281	281	281	281	281	281
no. of cult. days reqrd	19	13	11	9	8	7	7	6
expected finish day no	299	293	291	289	288	287	287	286
available work days	21	14	14	14	14	7	7	7
actual finish day no	299	293	291	289	288	287	287	286
non work days	0	0	0	0	0	0	0	0
actual finish week no	43	42	42	42	42	41	41	41
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	1851.66	2398.23	2975.60	3522.17	4099.54	4099.54	4099.54	4646.11
salvage value	769.80	997.02	1237.05	1464.28	1704.31	1704.31	1704.31	1931.54
repair cost	8.89	11.51	14.29	16.91	19.68	19.68	19.68	22.31
present annual cost.	244.73	313.01	385.94	455.16	528.28	528.28	528.28	597.50
annual cash flow	204.36	264.68	328.40	388.72	452.44	452.44	452.44	512.76
insurance ($/yr)	31.91	31.91	33.37	36.45	39.70	39.70	39.70	42.78
shelter ($/yr)	18.52	23.98	29.76	35.22	41.00	41.00	41.00	46.46
fuel cost	643.59	559.42	530.10	486.52	453.97	447.77	458.55	434.37
labour cost	772.59	556.10	465.18	398.72	348.88	317.24	291.33	258.96
* Tractor ann.cost/cult.	247.76	207.51	191.87	174.91	162.19	153.71	158.32	149.21
Cultivation cost ($)	1986.24	1714.12	1656.43	1605.26	1590.84	1543.54	1533.18	1544.21

Table 8.17 Feasible 2-WD tractor-cultivator combinations for cultivating a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		223	333	394	396	511	512	629	621
Tractor specification:									
max. power required	(kW)	38	46	52	60	63	67	72	77
Cultivator specification:									
no. of (blades/tines)/m		25	25	25	25	25	25	25	25
width	(m)	2.000	2.500	3.000	3.500	4.000	4.500	4.000	4.500
actual speed	(km/h)	4.05	4.50	4.48	5.38	4.93	4.91	5.36	5.36
actual work rate	(ha/h)	0.65	0.90	1.08	1.50	1.58	1.77	1.72	1.93
Operating condition:									
start week no		42	42	42	42	42	42	42	42
start day no		288	288	288	288	288	288	288	288
no. of cult. days reqrd		38	27	23	16	15	14	14	12
expected finish day no		325	314	310	303	302	301	301	299
available work days		42	28	28	21	21	14	14	14
actual finish day no		325	314	310	303	302	301	301	299
non work days		0	0	0	0	0	0	0	0
actual finish week no		47	45	45	44	44	43	43	43
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1851.66	2398.23	2975.60	3522.17	4099.54	4646.11	4099.54	4646.11
salvage value		769.80	997.02	1237.05	1464.28	1704.31	1931.54	1704.31	1931.54
repair cost		23.46	30.39	37.70	44.63	51.94	58.87	51.94	58.87
present annual cost.		250.62	320.64	395.41	466.37	541.32	612.28	541.32	612.28
annual cash flow		204.36	264.68	328.40	388.72	452.44	512.76	452.44	512.76
insurance	($/yr)	31.91	31.91	33.37	36.45	39.70	42.78	39.70	42.78
shelter	($/yr)	18.52	23.98	29.76	35.22	41.00	46.46	41.00	46.46
fuel cost		1287.18	1118.84	1060.21	998.11	895.53	769.19	917.10	868.74
labour cost		1545.18	1112.20	930.36	664.47	634.48	565.24	582.67	517.93
* Tractor ann.cost/cult.		495.53	415.02	383.74	324.38	307.42	273.87	316.64	298.41
Cultivation cost	($)	3683.21	3066.96	2873.27	2584.04	2491.14	2338.05	2470.42	2416.46

Table 8.18 Feasible 2-WD tractor-cultivator combinations for cultivating a 300 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		223	333	394	395	511	512	513	621
Tractor specification:									
max. power required (kW)		38	46	52	60	63	67	72	77
Cultivator specification:									
no. of (blades/tines)/m		25	25	25	25	25	25	25	25
width	(m)	2.000	2.500	3.000	3.500	4.000	4.000	4.000	4.500
actual speed	(km/h)	4.05	4.50	4.48	4.48	4.93	3.58	5.36	5.36
actual work rate	(ha/h)	0.65	0.90	1.08	1.25	1.58	1.15	1.72	1.93
Operating condition:									
start week no		42	41	42	42	42	42	42	42
start day no		288	281	288	288	288	288	288	288
no. of cult. days reqrd		57	41	34	29	23	32	21	19
expected finish day no		344	321	321	316	310	319	308	306
available work days		63	42	35	35	28	35	21	21
actual finish day no		344	321	321	316	310	319	308	306
non work days		0	0	0	0	0	0	0	0
actual finish week no		50	46	46	46	45	46	44	44
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1851.66	2398.23	2975.60	3522.17	4099.54	4099.54	4099.54	4646.11
salvage value		769.80	997.02	1237.05	1464.28	1704.31	1704.31	1704.31	1931.54
repair cost		41.39	53.61	66.51	78.73	91.63	91.63	91.63	103.85
present annual cost.		257.87	330.03	407.05	480.15	557.37	557.37	557.37	630.47
annual cash flow		204.36	264.68	328.40	388.72	452.44	452.44	452.44	512.76
insurance	($/yr)	31.91	31.91	33.37	36.45	39.70	39.70	39.70	42.78
shelter	($/yr)	18.52	23.98	29.76	35.22	41.00	41.00	41.00	46.46
fuel cost		1930.77	1678.26	1590.31	1459.55	1343.30	1270.71	1375.65	1303.11
labour cost		2317.77	1668.30	1395.54	1196.17	951.72	1308.79	874.00	776.89
* Tractor ann.cost/cult.		743.29	622.52	575.62	524.73	461.13	471.21	474.97	447.62
Cultivation cost	($)	5381.54	4421.56	4092.28	3787.10	3441.75	3739.42	3410.66	3292.11

Table 8.19 Water properties at 0.20m plough cut depth for Winton soil series.

Moisture content		Liquid limit		Plastic limit		Field capacity	Wilting point		Cone index
(%,w/w)	(%of FC)	(%,w/w)	(%of FC)	(%,w/w)	(%of FC)	(mm)	(%,w/w)	(%of FC)	(MPa)
27.15	100.00	43.75	160.00	28.25	104.00	130.00	17.00	62.000	1-34

FC = field capacity.

Table 8.20a Number of days available for field operations at a soil workability of 110% of FC and probability level of 90% for Winton soil series in 4 quarters

Number of workable days			
1st quarter	2nd quarter	3rd quarter	4th quarter
91	91	91	91

Table 8.20b Number of days available for field operations at a soil workability of 105% of FC and probability level of 90% for Winton soil series in 4 quarters.

Number of workable days			
1st quarter	2nd quarter	3rd quarter	4th quarter
16	36	55	26

Table 8.21a Feasible 2-WD tractor-drill combinations for drilling a 100 ha at 80% field efficiency, a soil workablitiy criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		223	333	394	396	511	512	513	621
Tractor specification:									
max. power required (kW)		38	46	52	60	63	67	72	77
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		20	20	25	30	35	40	45	50
width	(m)	2.000	2.000	2.500	3.000	3.500	4.000	4.500	5.000
actual speed	(km/h)	4.49	4.50	4.48	4.48	4.47	4.47	4.47	4.47
actual work rate	(ha/h)	0.72	0.72	0.90	1.08	1.25	1.43	1.61	1.79
Operating condition:									
start week no		41	41	42	42	42	42	42	42
start day no		281	281	288	288	288	288	288	288
no. of drilling days		17	17	13	11	9	8	7	6
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		297	297	300	298	296	295	294	293
available work days		21	21	14	14	14	14	7	7
non work days		0	0	0	0	0	0	0	0
actual finish day no		297	297	300	298	296	295	294	293
actual finish week no		43	43	43	43	43	43	42	42
average early loss	(%)	0.3330	0.3330	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947
average late loss	(%)	0.0014	0.0014	0.0232	0.0058	0.0000	0.0000	0.0000	0.0000
average crop loss	(%)	0.3344	0.3344	0.1179	0.1005	0.0947	0.0947	0.0947	0.0947
average crop yield	(t/ha)	6.1793	6.1793	6.1927	6.1938	6.1941	6.1941	6.1941	6.1941
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		907.87	907.87	1689.67	2471.47	3253.27	4035.07	4816.87	5598.67
salvage value		377.43	377.43	702.45	1027.47	1352.49	1677.51	2002.53	2327.55
repair cost		7.41	7.41	13.79	20.17	26.55	32.92	39.30	45.68
present annual cost		128.83	128.83	224.72	322.28	421.16	520.19	619.21	718.23
annual cash flow		100.20	100.20	186.48	272.76	359.04	445.33	531.61	617.89
fuel cost		579.23	699.28	636.12	656.72	543.93	510.28	484.39	398.22
insurance	($/yr)	31.91	31.91	31.91	31.91	34.93	39.34	43.74	48.15
shelter	($/yr)	9.08	9.08	16.90	24.71	32.53	40.35	48.17	55.99
labour cost		695.33	695.13	558.21	465.29	399.70	349.74	310.88	279.83
* Tractor ann.cost/drill		222.99	259.39	230.25	225.44	193.66	178.61	168.94	135.58
Drilling cost	($)	1691.79	1851.33	1722.37	1749.59	1645.88	1656.75	1692.40	1649.98
Yield loss cost	($)	207.36	207.36	73.11	62.32	58.73	58.73	58.73	58.73
Total operation cost	($)	7458.71	7249.66	6627.32	6134.58	624	7260.23	6817.16	6287.67

Table 8.21b Feasible 2-WD tractor-drill combinations for drilling a 100 ha at 80% field efficiency, a soil workability criterion of 105% and probability level of 90% (soil series Winton).

Single combination no.		223	333	394	396	511	512	513	621
Tractor specification:									
max. power required (kW)		38	46	52	60	63	67	72	77
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		20	20	25	30	35	40	45	0.100
width	(m)	2.000	2.000	2.500	3.000	3.500	4.000	4.500	50
actual speed	(km/h)	4.49	4.50	4.48	4.48	4.47	4.47	4.47	5.000
actual work rate	(ha/h)	0.72	0.72	0.90	1.08	1.25	1.43	1.61	4.47
									1.79
Operating condition:									
start week no		41	41	42	42	42	42	42	42
start day no		281	281	288	288	288	288	288	288
no. of drilling days		17	17	13	11	9	8	7	6
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		297	297	300	298	296	295	294	293
available work days		18	18	15	11	11	11	11	6
non work days		59	59	55	52	52	52	52	50
actual finish day no		353	353	352	350	346	345	344	343
actual finish week no		51	51	51	50	50	50	50	49
average early loss	(%)	0.3330	0.3330	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947
average late loss	(%)	4.7111	4.7111	4.5472	4.2282	3.6250	3.4815	3.3408	3.2030
average crop loss	(%)	5.0441	5.0441	4.6419	4.3229	3.7197	3.5762	3.4355	3.2978
average crop yield(t/ha)		5.8873	5.8873	5.9122	5.9320	5.9694	5.9783	5.9870	5.9955
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		907.87	907.87	1689.67	2471.47	3253.27	4035.07	4816.87	5598.67
salvage value		377.43	377.43	702.45	1027.47	1352.49	1677.51	2002.53	2327.55
repair cost		7.41	7.41	13.79	20.17	26.55	32.92	39.30	45.68
present annual cost		128.83	128.83	224.72	322.28	421.16	520.19	619.21	718.23
annual cash flow		100.20	100.20	186.48	272.76	359.04	445.33	531.61	617.89
fuel cost		579.23	699.28	636.12	567.60	543.93	510.28	484.39	393.22
insurance	($/yr)	31.91	31.91	31.91	31.91	34.93	39.34	43.74	48.15
shelter	($/yr)	9.08	9.08	16.90	24.71	32.53	40.35	48.17	55.99
labour cost		695.33	695.13	558.21	485.18	399.70	349.74	310.88	279.83
* Tractor ann.cost/drill		222.99	259.39	230.25	204.06	193.66	178.61	168.94	135.58
Drilling cost	($)	1691.79	1851.33	1722.37	1637.07	1645.88	1656.75	1692.40	1649.98
Yield loss cost	($)	3127.31	3127.31	2877.99	2680.21	2306.22	2217.23	2130.02	2044.62
Total operation cost	($)	10378.66	9950.37	9432.20	9027.05	8494.72	9418.72	8888.46	8273.56

Table 8.22 Feasible 2-WD tractor-drill combinations for drilling a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		223	333	94	396	511	512	513	621
Tractor specification:									
max. power required	(kW)	38	46	52	60	63	67	72	77
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		20	20	25	30	35	40	45	50
width	(m)	2.000	2.000	2.500	3.000	3.500	4.000	4.500	5.000
actual speed	(km/h)	4.49	4.50	4.48	4.48	4.47	4.47	4.47	4.47
actual work rate	(ha/h)	0.72	0.72	0.90	1.08	1.25	1.43	1.61	1.79
Operating condition:									
start week no		40	40	41	41	41	41	42	42
start day no		274	274	281	281	281	281	288	288
no. of drilling days		34	34	27	23	19	17	15	13
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		307	307	307	303	299	297	302	300
available work days		35	35	28	28	21	21	21	14
non work days		0	0	0	0	0	0	0	0
actual finish day no		307	307	307	303	299	297	302	300
actual finish week no		44	44	44	44	43	43	44	43
average early loss	(%)	0.7163	0.7163	0.3330	0.3330	0.3330	0.3330	0.0947	0.0947
average late loss	(%)	0.1755	0.1755	0.1755	0.0711	0.0131	0.0014	0.0522	0.0232
average crop loss	(%)	0.8918	0.8918	0.5084	0.4040	0.3460	0.3344	0.1469	0.1179
average crop yield	(t/ha)	6.1447	6.1447	6.1685	6.1749	6.1785	6.1793	6.1909	6.1927
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		907.87	907.87	1689.67	2471.47	3253.27	4035.07	4816.87	5598.67
salvage value		377.43	377.43	702.45	1027.47	1352.49	1677.51	2002.53	2327.55
repair cost		45.73	45.73	85.11	124.49	163.87	203.24	242.62	282.00
present annual cost		138.02	138.02	241.83	347.31	454.10	561.04	667.98	774.92
annual cash flow		100.20	100.20	186.48	272.76	359.04	445.33	531.61	617.89
fuel cost		1158.46	1398.55	1272.25	1135.20	1087.86	1020.56	968.78	796.44
insurance	($/yr)	31.91	31.91	31.91	31.91	34.93	39.34	43.74	48.15
shelter	($/yr)	9.08	9.08	16.90	24.71	32.53	40.35	48.17	55.99
labour cost		1390.66	1390.25	1116.43	930.36	799.40	699.48	621.76	559.66
* Tractor ann.cost/drill		445.97	518.77	460.49	408.12	387.33	357.23	337.89	271.17
Drilling cost	($)	3222.96	3542.04	3188.32	2920.26	2836.08	2754.48	2722.46	2534.28
Yield loss cost	($)	1105.79	1105.79	630.48	501.02	429.11	414.71	182.18	146.23
Total operation cost	($)	14720.12	14013.36	12763.75	12046.06	11001.87	13367.78	12070.85	10673.40

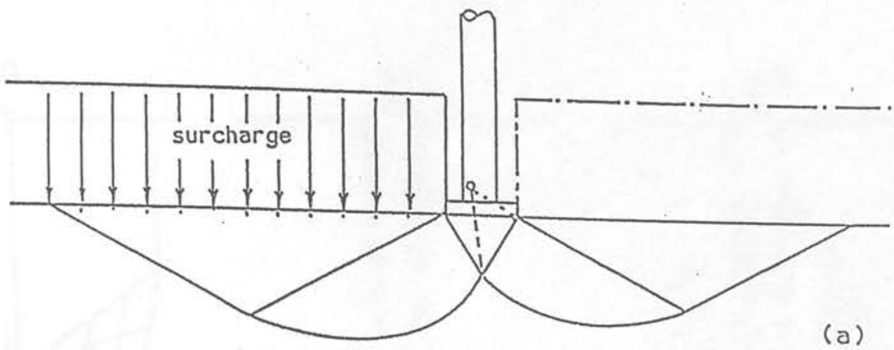
Table 8.23 Feasible 2-WD tractor-drill combinations for drilling a 300 ha at 80% field efficiency a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		223	333	394	396	511	512	513	621
Tractor specification:									
max. power required (kW)		38	46	52	60	63	67	72	77
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	100	0.100	0.100	0.100	0.100
number of coulters		20	20	25	30	35	40	45	50
width	(m)	2.000	2.000	2.500	3.000	3.500	4.000	4.500	5.000
actual speed	(km/h)	4.49	4.50	4.48	4.48	4.47	4.47	4.47	4.47
actual work rate	(ha/h)	0.72	0.72	0.90	1.08	1.25	1.43	1.61	1.79
Operating condition:									
start week no		39	39	40	40	41	41	41	41
start day no		267	267	274	274	281	281	281	281
no. of drilling days		52	52	41	34	29	26	23	20
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		318	318	314	307	309	306	303	300
available work days		56	56	42	35	35	28	28	21
non work days		0	0	0	0	0	0	0	0
actual finish day no		318	318	314	307	309	306	303	300
actual finish week no		46	46	45	44	45	44	44	43
average early loss	(%)	1.2447	1.2447	0.7163	0.7163	0.3330	0.3330	0.3330	0.3330
average late loss	(%)	0.7018	0.7018	0.4698	0.1755	0.2451	0.1450	0.0711	0.0232
average crop loss	(%)	1.9465	1.9465	1.1861	0.8918	0.5781	0.4780	0.4040	0.3562
average crop yield(t/ha)		6.0793	6.0793	6.1265	6.1447	6.1642	6.1704	6.1749	6.1779
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		907.87	907.87	1689.67	2471.47	3253.27	4035.07	4816.87	5598.67
salvage value		377.43	377.43	702.45	1027.47	1352.49	1677.51	2002.53	2327.55
repair cost		132.62	132.62	246.82	361.03	475.23	589.43	703.64	817.84
present annual cost		158.87	158.87	280.63	404.05	528.80	653.69	778.57	903.46
annual cash flow		100.20	100.20	186.48	272.76	359.04	445.33	531.61	617.89
fuel cost		1737.69	2097.83	1908.37	1702.81	1631.79	1530.85	1453.18	1194.66
insurance	($/yr)	31.91	31.91	31.91	31.91	34.93	39.34	43.74	48.15
shelter	($/yr)	9.08	9.08	16.90	24.71	32.53	40.35	48.17	55.99
labour cost		2085.99	2085.38	1674.64	1395.54	1199.11	1049.22	932.64	839.49
* Tractor ann.cost/drill		668.96	778.16	690.74	612.18	580.99	535.84	506.83	406.75
Drilling cost	($)	4765.78	5244.40	4675.96	4235.16	4068.03	3903.99	3814.33	3490.43
Yield loss cost	($)	3620.45	3620.45	2206.18	1658.69	1075.17	889.08	751.53	662.53
Total operation cost	($)	23397.96	22627.19	19673.23	18167.08	16415.65	19670.39	17857.59	15590.62

Table 8.24 2-WD tractor-plough combination cost details for used hours in table 8.10.

Single combination no.	223	333	394	396	511	512	513	621
front axle load (kN)	16.10	17.04	22.12	22.12	22.94	26.34	37.51	37.51
rear axle load (kN)	36.71	38.78	50.90	50.90	53.81	61.11	69.72	69.72
tractor power reqrd (kW)	38	46	52	60	63	67	72	77
plough bodies	3	3	4	4	5	5	5	5
Finance:								
loan interest rate	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
investment interst rate	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
tax rate	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
inflation rate	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Tractor:								
purchase price ($)	9266.62	10796.06	11943.14	13472.58	14046.12	14810.84	15766.74	16722.64
purchase age (yr)	0	0	0	0	0	0	0	0
salvage price ($)	3534.63	4118.02	4555.56	5138.94	5357.71	5649.40	6014.02	6378.63
sale age (yr)	5	5	5	5	5	5	5	5
road tax ($)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
insurance ($)	68.00	76.49	82.85	91.34	94.24	97.60	101.80	106.00
shelter ($)	92.67	107.96	119.43	134.73	140.46	148.11	157.67	167.23
annual hours (h)	1000	1000	1000	1000	1000	1000	1000	1000
ploughing hours (h)	132	154	132	116	159	149	139	139
repair by ploughing ([a]%)	1.53	1.78	1.53	1.34	1.85	1.72	1.61	1.61
repair by tillage ([a]%)	5.09	4.35	3.68	2.95	3.15	5.31	4.30	2.81
repair(% purchase price)	11.54	11.54	11.54	11.54	11.54	11.54	11.54	11.54
repair by ploughing ($)	180.72	245.57	233.74	230.71	330.69	325.44	324.80	344.35
repair by tillage ($)	602.41	599.20	560.98	507.57	564.51	1003.45	866.12	599.42
annual repair cost ($)	1364.54	1589.75	1758.66	1983.88	2068.33	2180.94	2321.70	2462.46
ann cost by ploughing($)	212.37	288.21	274.10	270.31	387.33	381.04	380.12	402.86
ann cost by tillage ($)	707.89	703.22	657.85	594.69	661.20	1174.89	1013.66	701.27
annaul cost ($)	1603.46	1865.74	2062.35	2324.38	2422.62	2553.54	2717.20	2880.85
annual cash flow ($)	1082.73	1261.44	1395.46	1574.17	1641.18	1730.53	1842.22	1953.91
Plough:								
purchase price ($)	1322.54	1322.54	1815.49	1815.49	2308.46	2308.46	2308.46	2308.46
purchase age (yr)	5	5	5	5	5	5	5	5
salvage price ($)	549.82	549.82	754.76	754.76	959.70	959.70	959.70	959.70
sale age (yr)	5	5	5	5	5	5	5	5
insurance ($/yr)	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91
shelter cost ($/yr)	13.23	13.23	18.15	18.15	23.08	23.08	23.08	23.08
repair(% purchase price)	0.97	1.64	1.64	1.64	3.41	3.41	3.41	3.41
repair cost ($)	16.42	27.64	37.95	37.95	100.51	100.51	100.51	100.51
annual cost ($)	182.41	186.04	249.02	249.02	329.81	329.81	329.81	329.81
annual cash flow ($)	145.96	145.96	200.37	200.37	254.77	254.77	254.77	254.77

[a] % of purchase price.



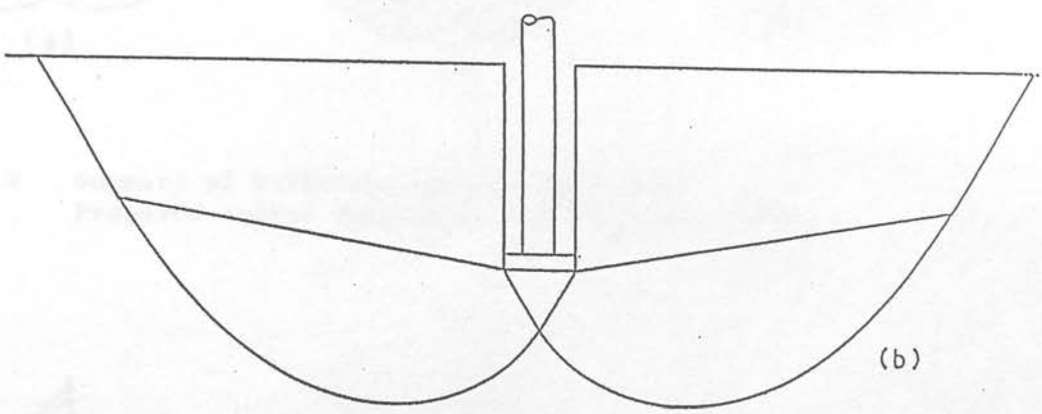


Fig 3.1 Soil failure zones for a strip foundation

(a) resting on the soil surface with separate rupture geometry to account for the effect of weight (RHS) and for the effect of cohesion and a surcharge (LHS);

(b) at shallow depth with the soil above the foundation level treated as an integral part of the failure zone.

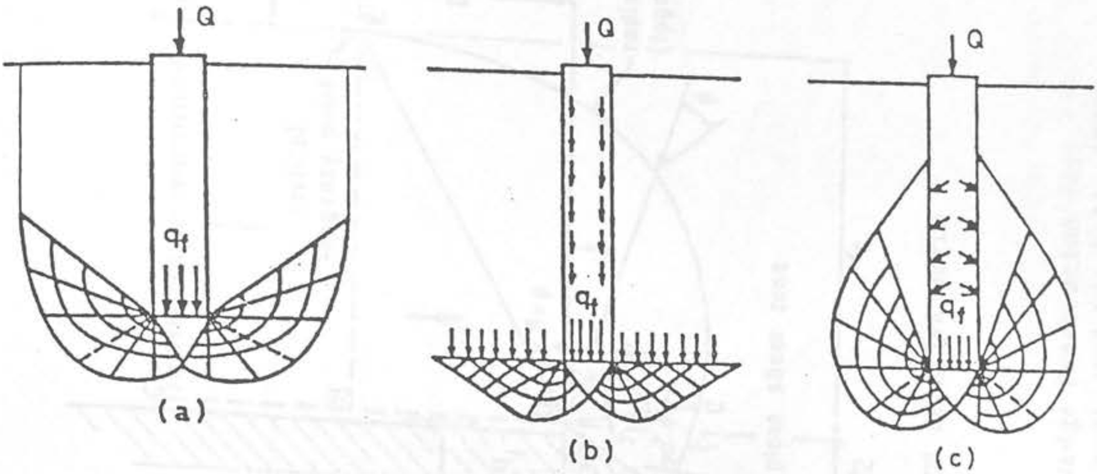


Fig 3.2 Summary of Different Failure Mechanisms Proposed (after Durgunoglu and Mitchell, 1974).

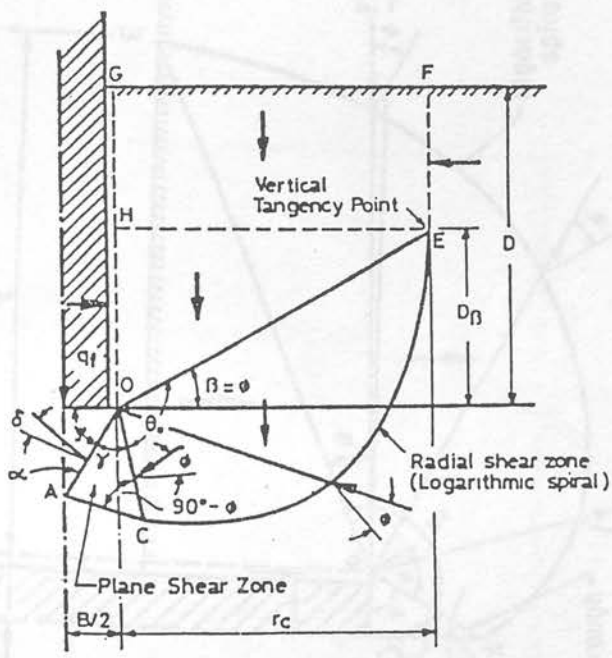
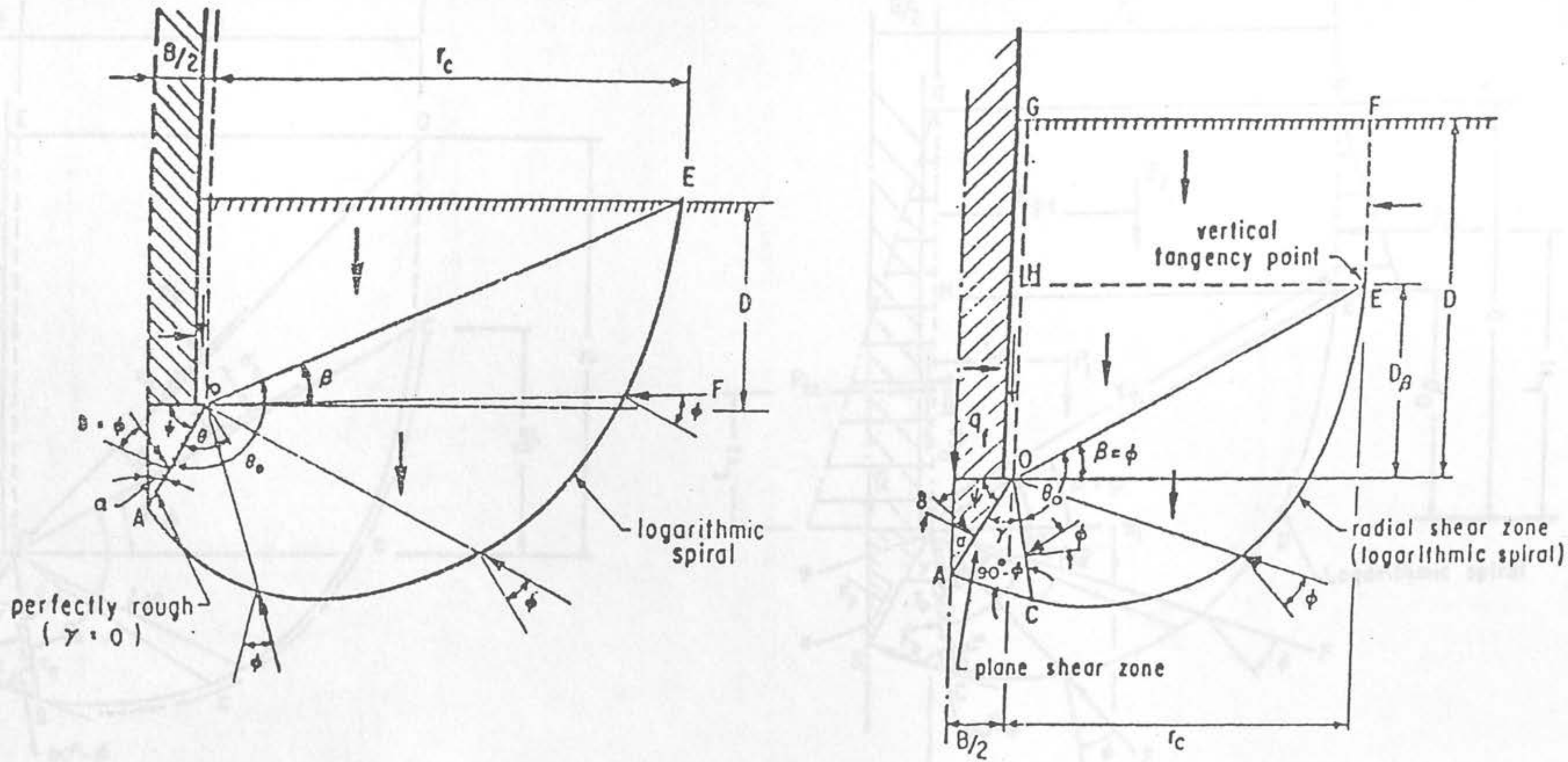


Fig 3.3 Proposed Failure Mechanism Associated with Wedge Penetration into Soils for Large Relative Depths (after Durgunoglu and Mitchell, 1974).



SMALL RELATIVE DEPTH

LARGE RELATIVE DEPTH

Fig 3.4 Proposed Failure Mechanism Associated with Wedge Penetration for Small and Large Relative Depths (after Durgunoglu and Mitchell, 1973).

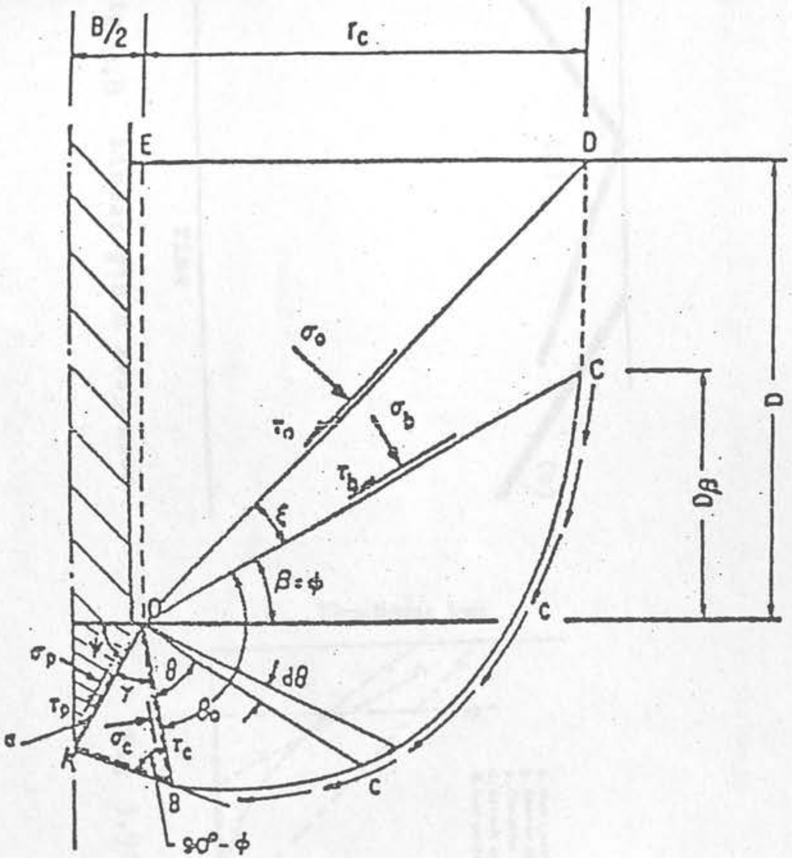


Fig 3.5 Free Body Diagram for Determination of Bearing Capacity Factor Ncq(after Durgunoglu and Mitchell, 1973).

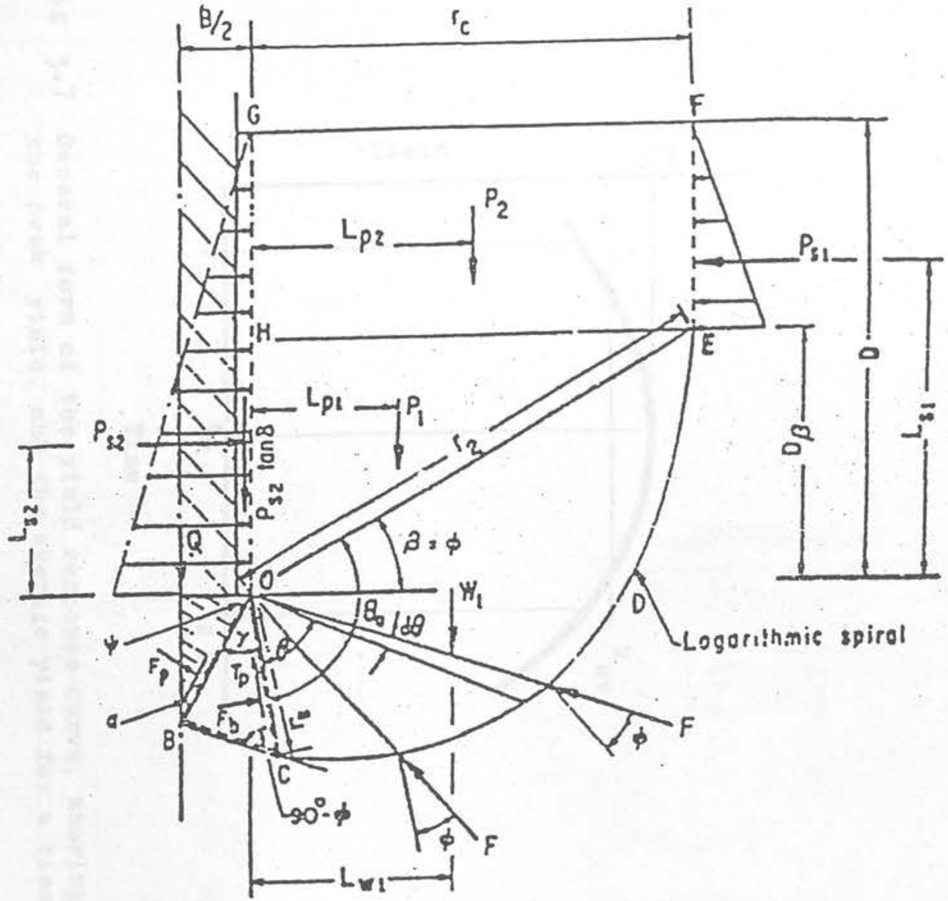


Fig 3.6 Free Body Diagram for Determination of Bearing Capacity Factor Nγq (after Durgunoglu and Mitchell, 1973).

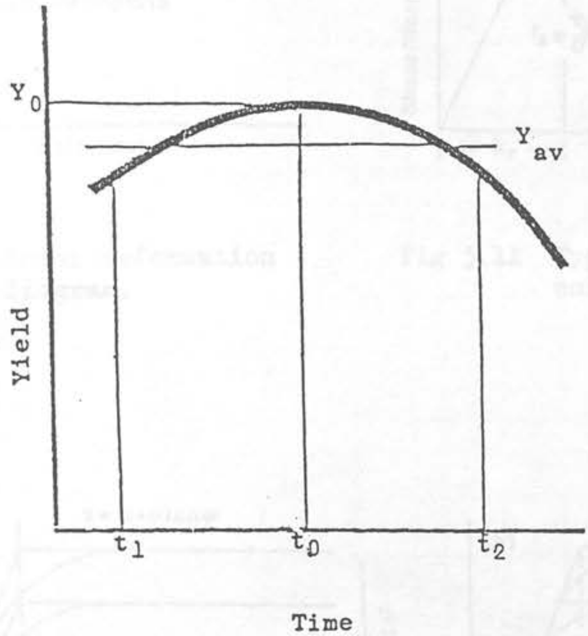


Fig 3.7 General form of the yield response curve, showing the peak yield, and the average yield for a timespan.

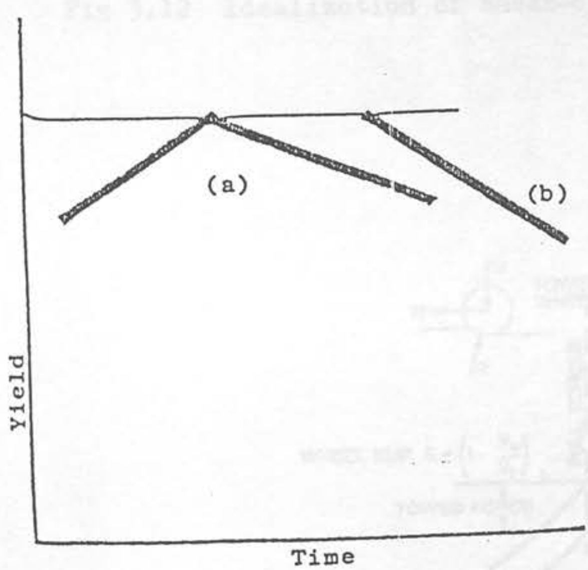


Fig 3.8 Linear yield responses

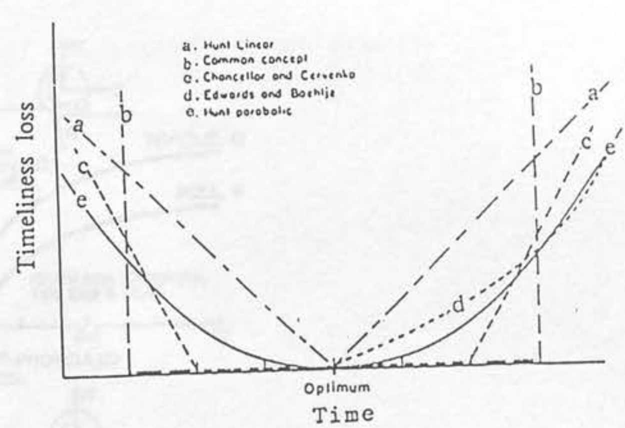


Fig 3.9 Timeliness loss models.

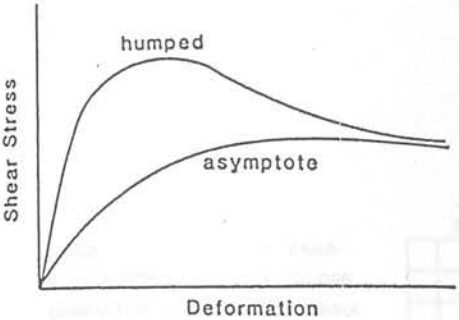


Fig 3.10 Shear deformation diagram.

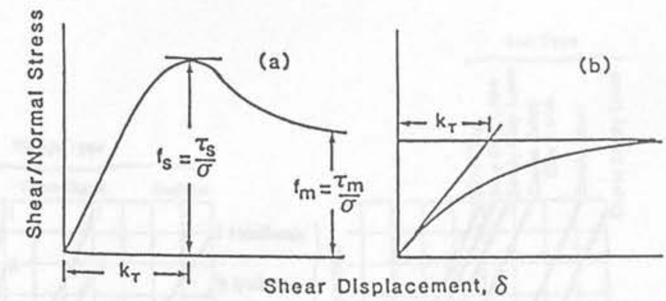


Fig 3.11 Typical shear stress deformation curves.

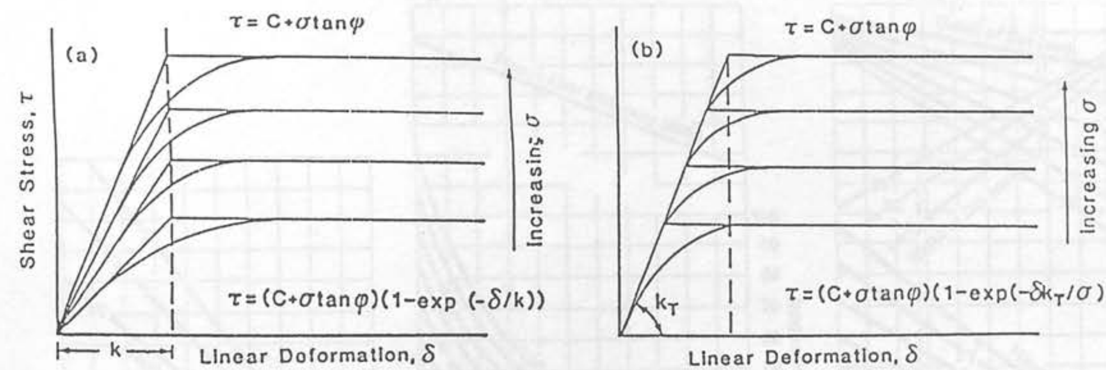


Fig 3.12 Idealization of shear-deformation diagram.

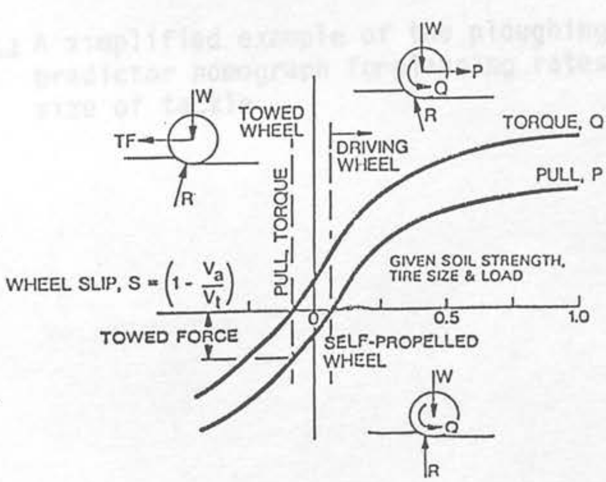


Fig 3.13 Pull-torque-slip relation, wheels on soil.

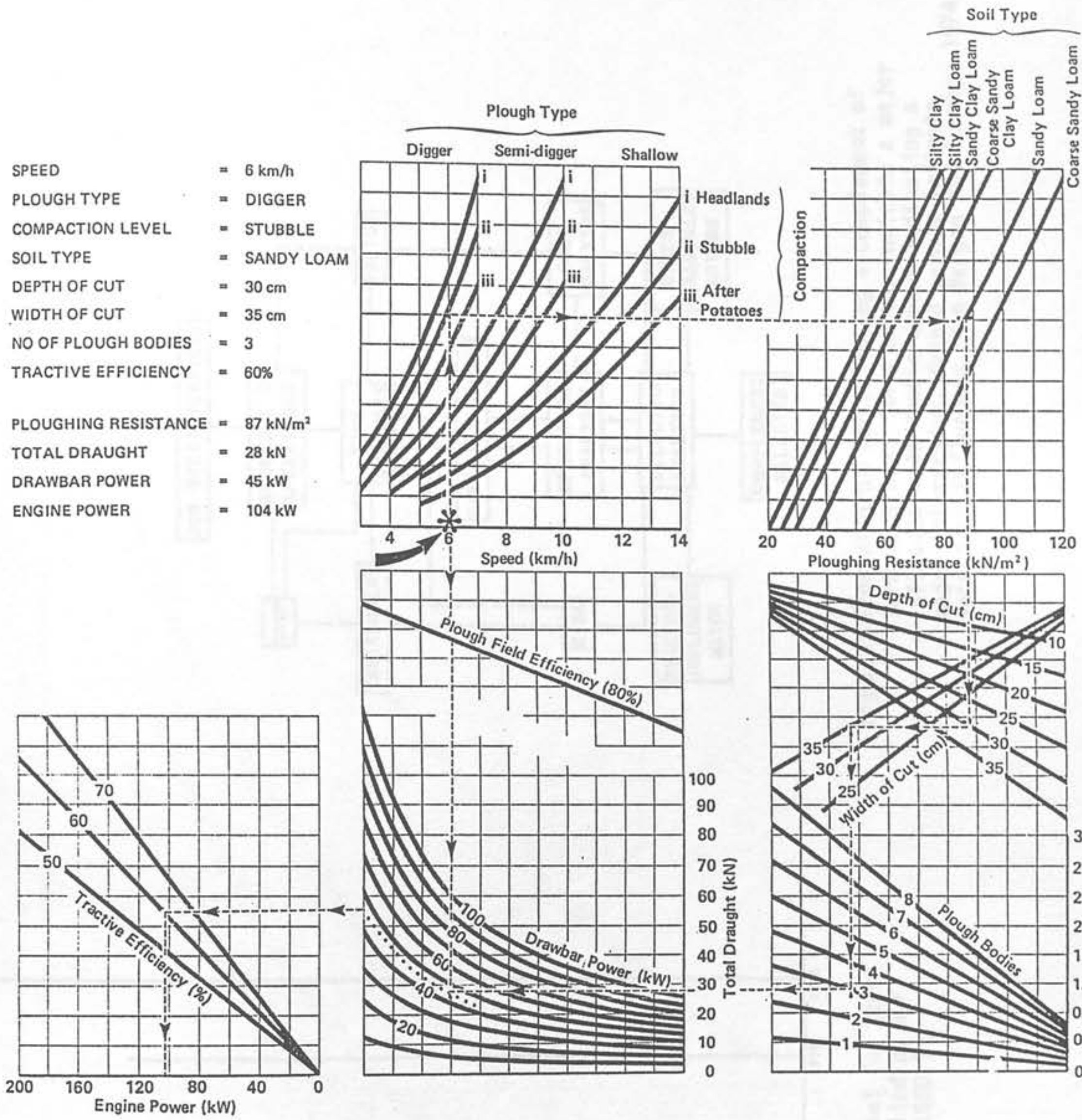


Fig 3.14 A simplified example of the ploughing performance predictor nomograph for planning rates of work and size of tackle

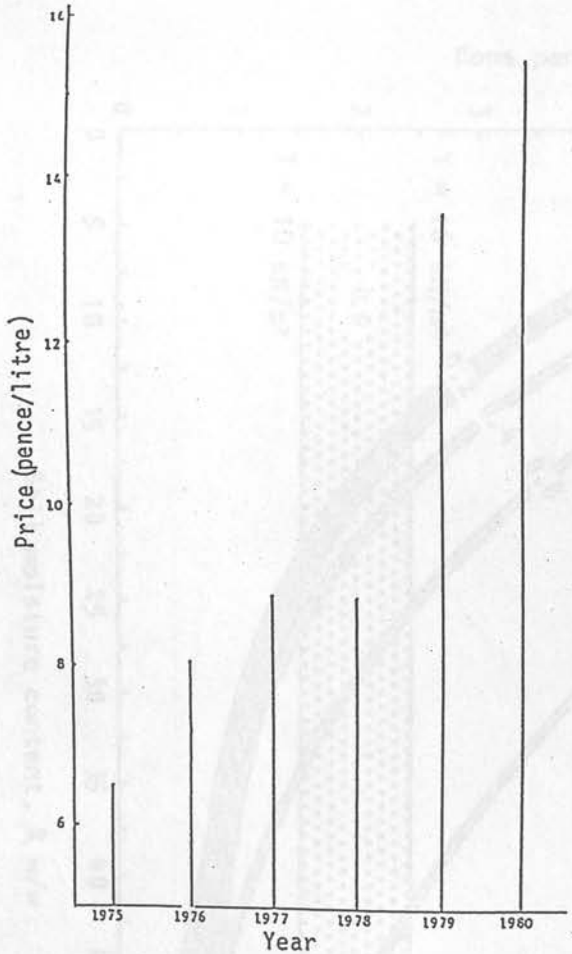


Fig 3.15 Price of tractor diesel for years 1975-80. (Data supplied by B.P. St Boswells, August 1980.)

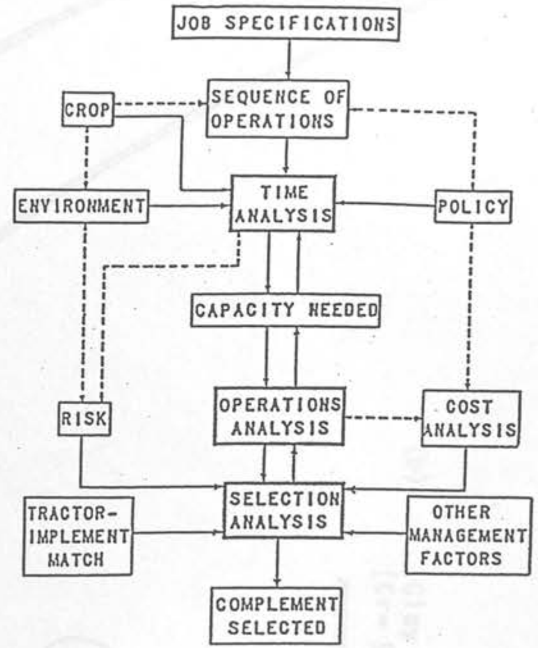


Fig 3.16 Flow diagram for selecting a complement of farm machines. Solid arrows indicate a major influence with double arrows indicating a major interaction, dashed arrows indicate secondary influences (Von Bargen and Cunney, 1974).

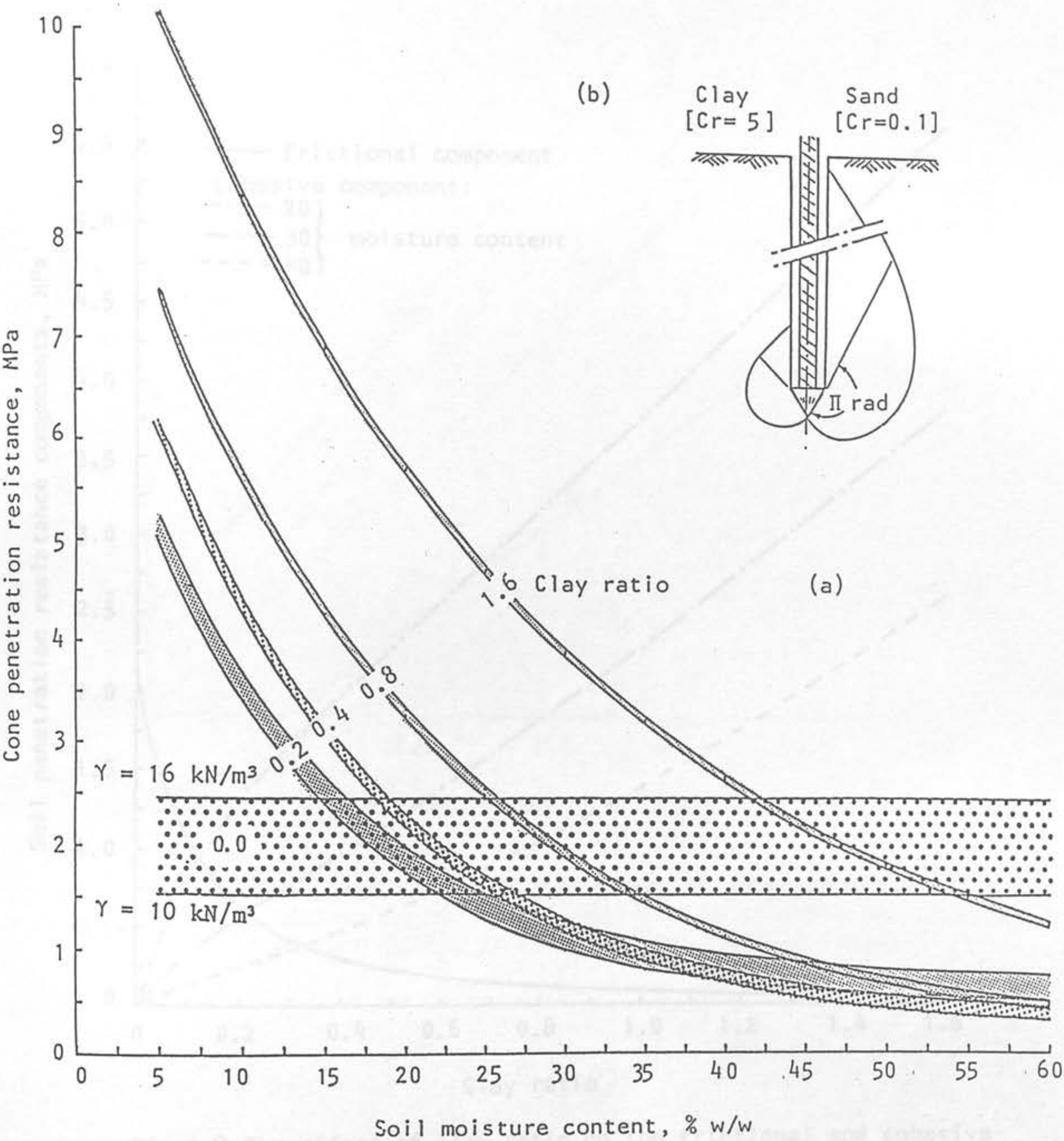


Fig 4.1 (a) The effect of soil moisture content and clay ratio on the cone penetration resistance for a band of soil specific weights from 10-16 kN/m³.

(b) The relative size of the pressure bulb formed at the base of a cone penetrometer for clay (LHS) and sand (RHS).

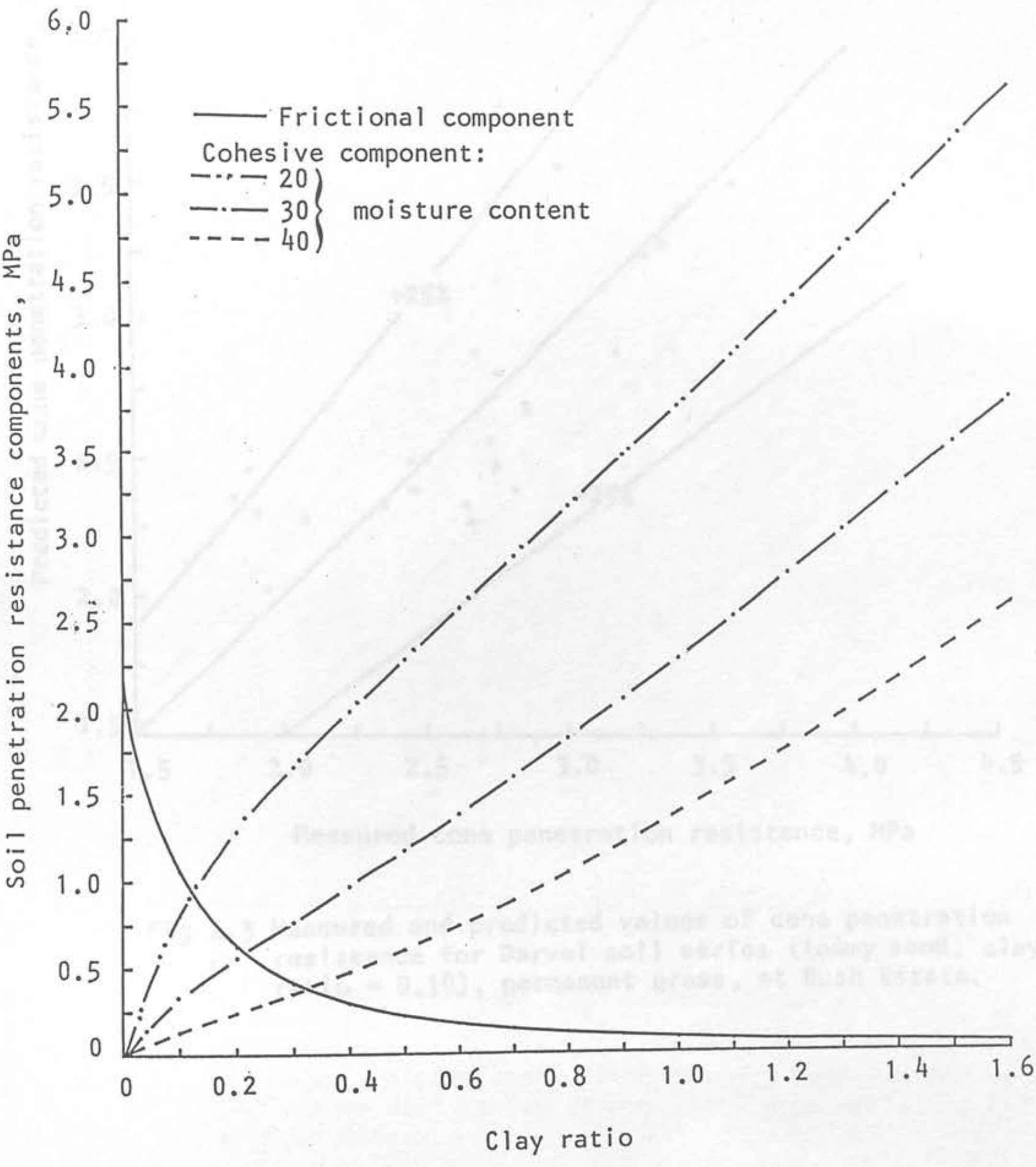


Fig 4.2 The effect of clay ratio on the frictional and cohesive components, of the soil penetration resistance at soil moisture contents of 20, 30 and 40%, w/w and a soil specific weight of 14 kN/m³.

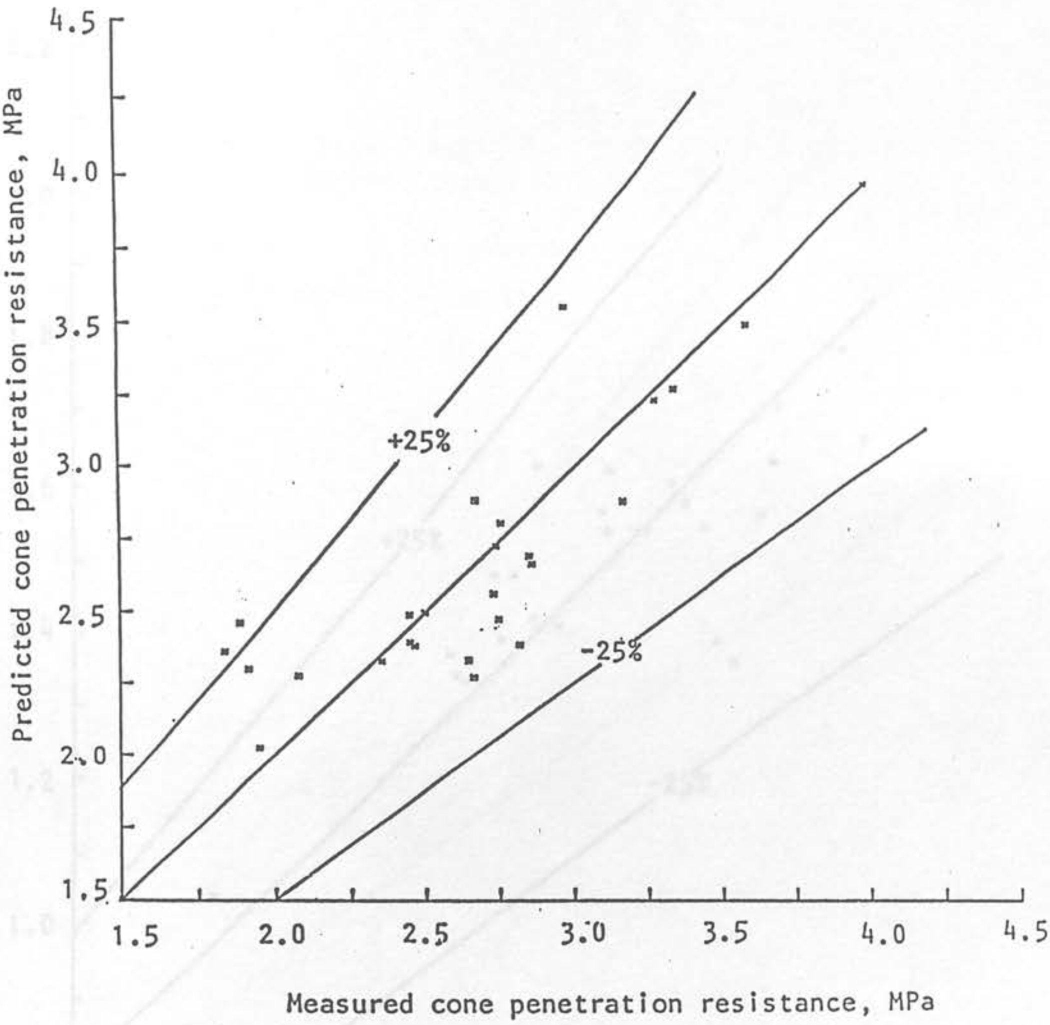


Fig 4.3 Measured and predicted values of cone penetration resistance for Darvel soil series (loamy sand, clay ratio = 0.10), permanent grass, at Bush Estate.

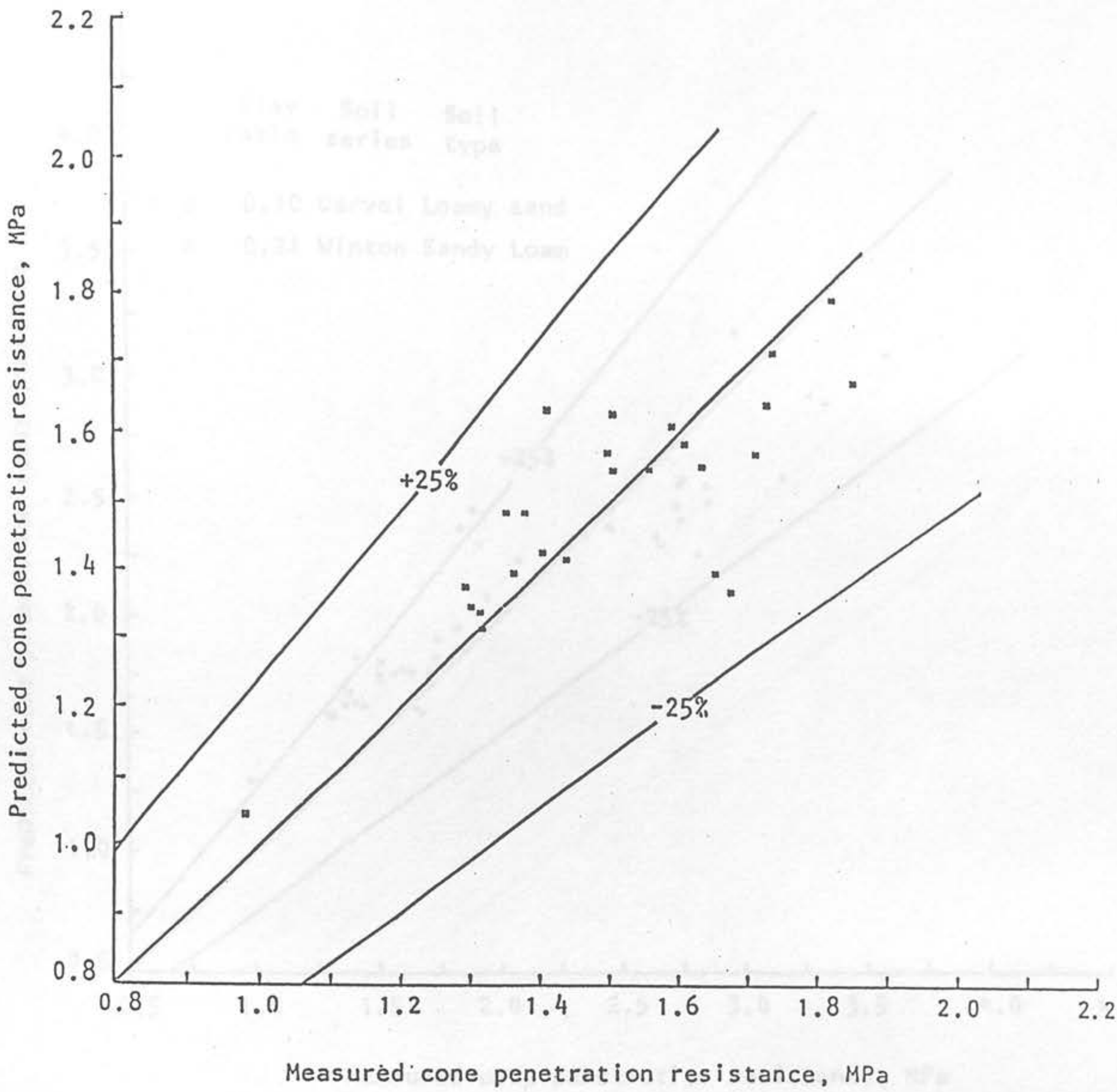


Fig 4.4 Measured and predicted values of cone penetration resistance for Winton soil series (sandy loam, clay ratio = 0.21), stubble at Bush Estate.

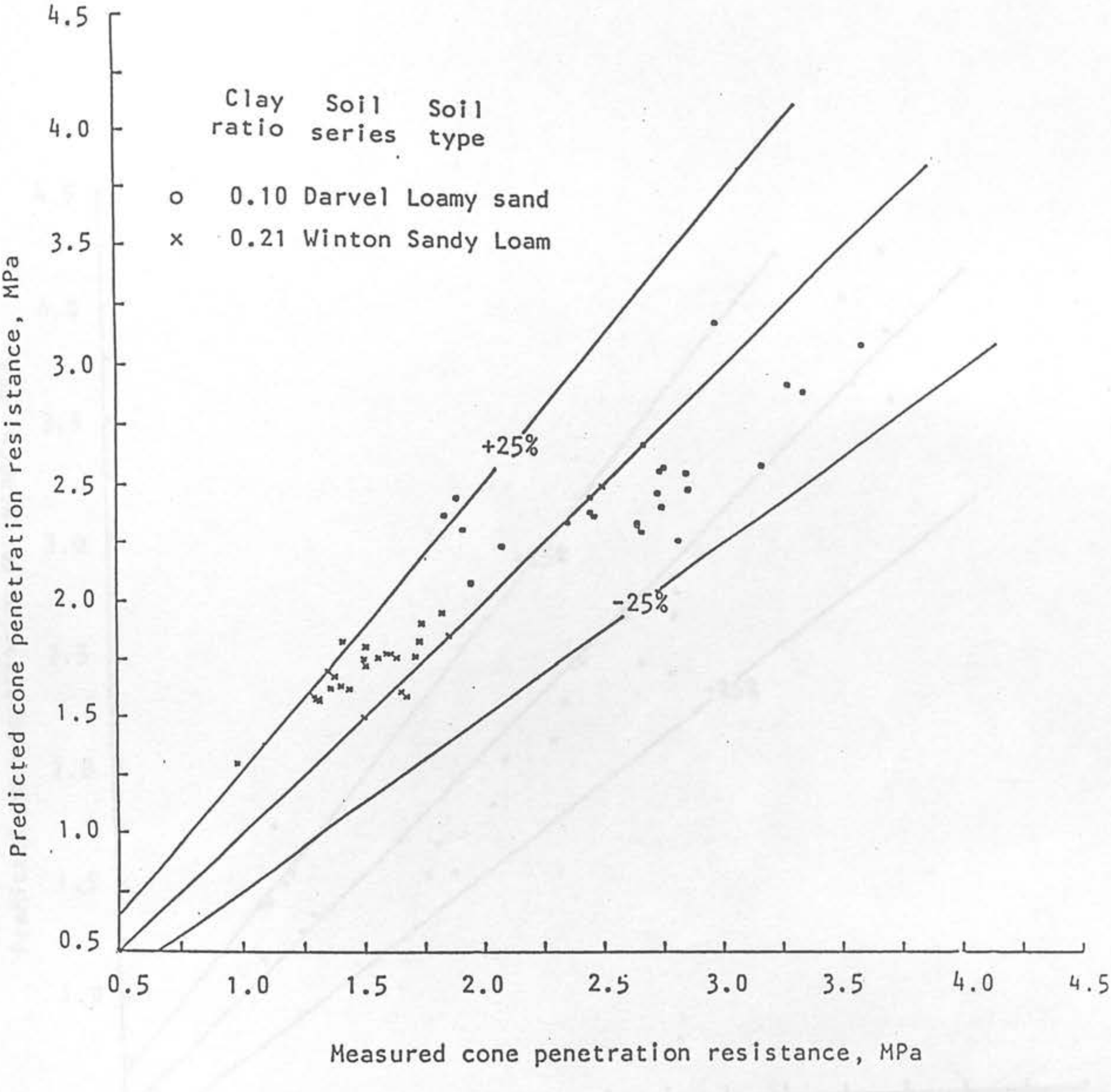


Fig 4.5 Measured and predicted values of cone penetration resistance for two soil types (surface cover: grass and stubble) at Bush Estate.

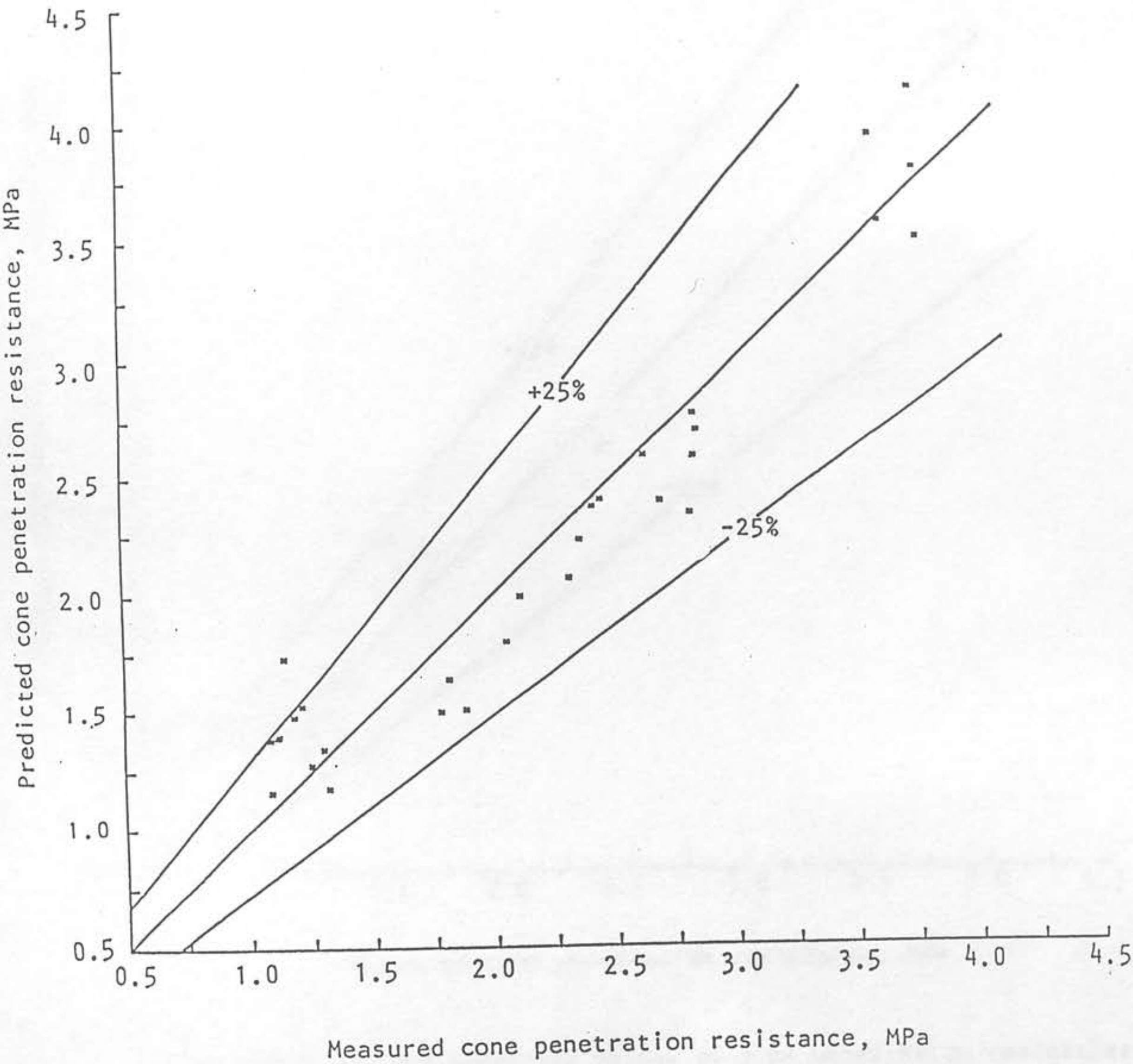


Fig 4.6 Measured and predicted values of cone penetration resistance for Stirling soil series (silty clay loam, clay ratio = 0.49), undersown, in the Stirling area.

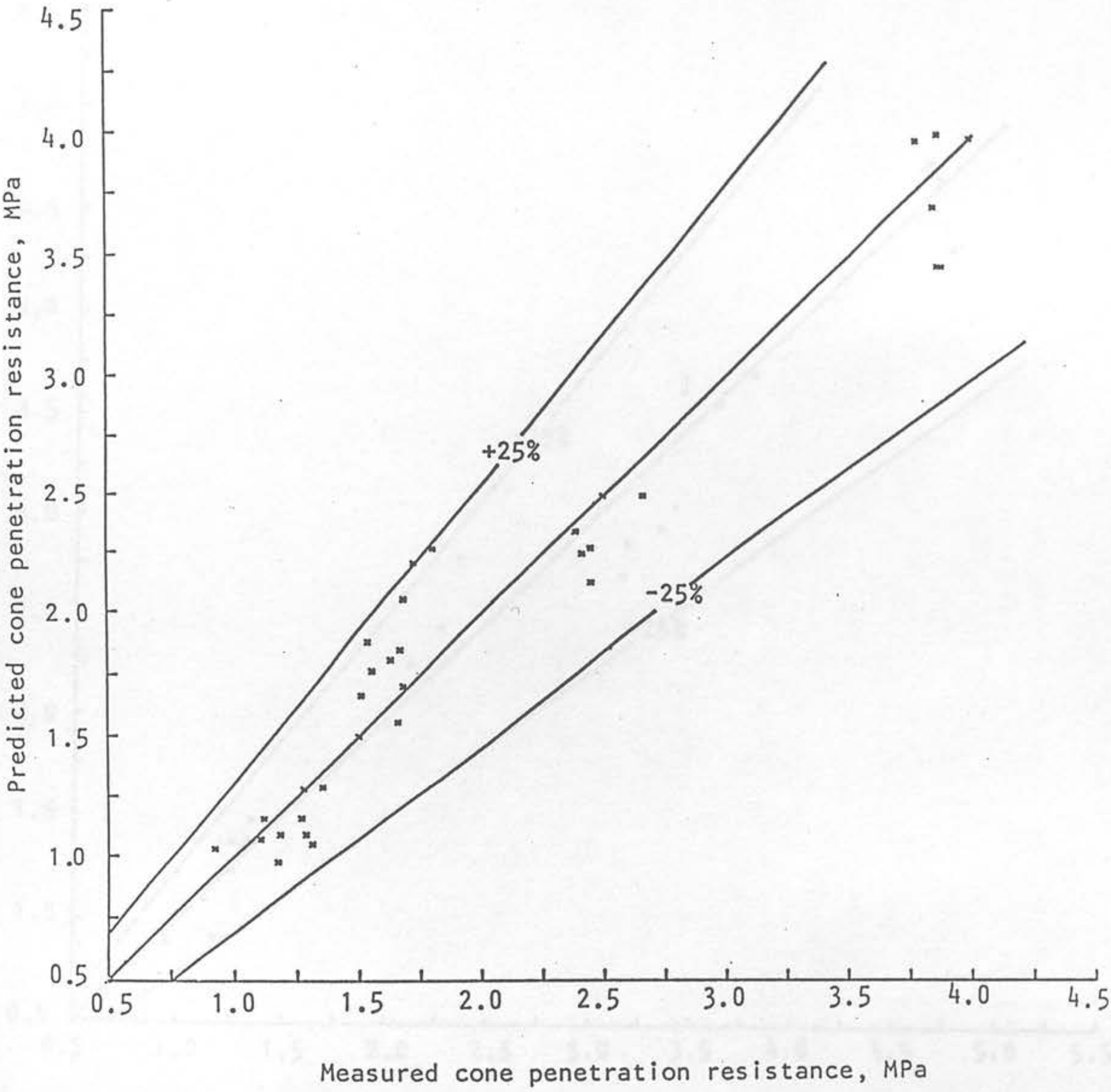


Fig 4.7 Measured and predicted values of cone penetration resistance for Stirling soil series (silty clay loam, clay ratio = 0.54), stubble, in the Stirling area.

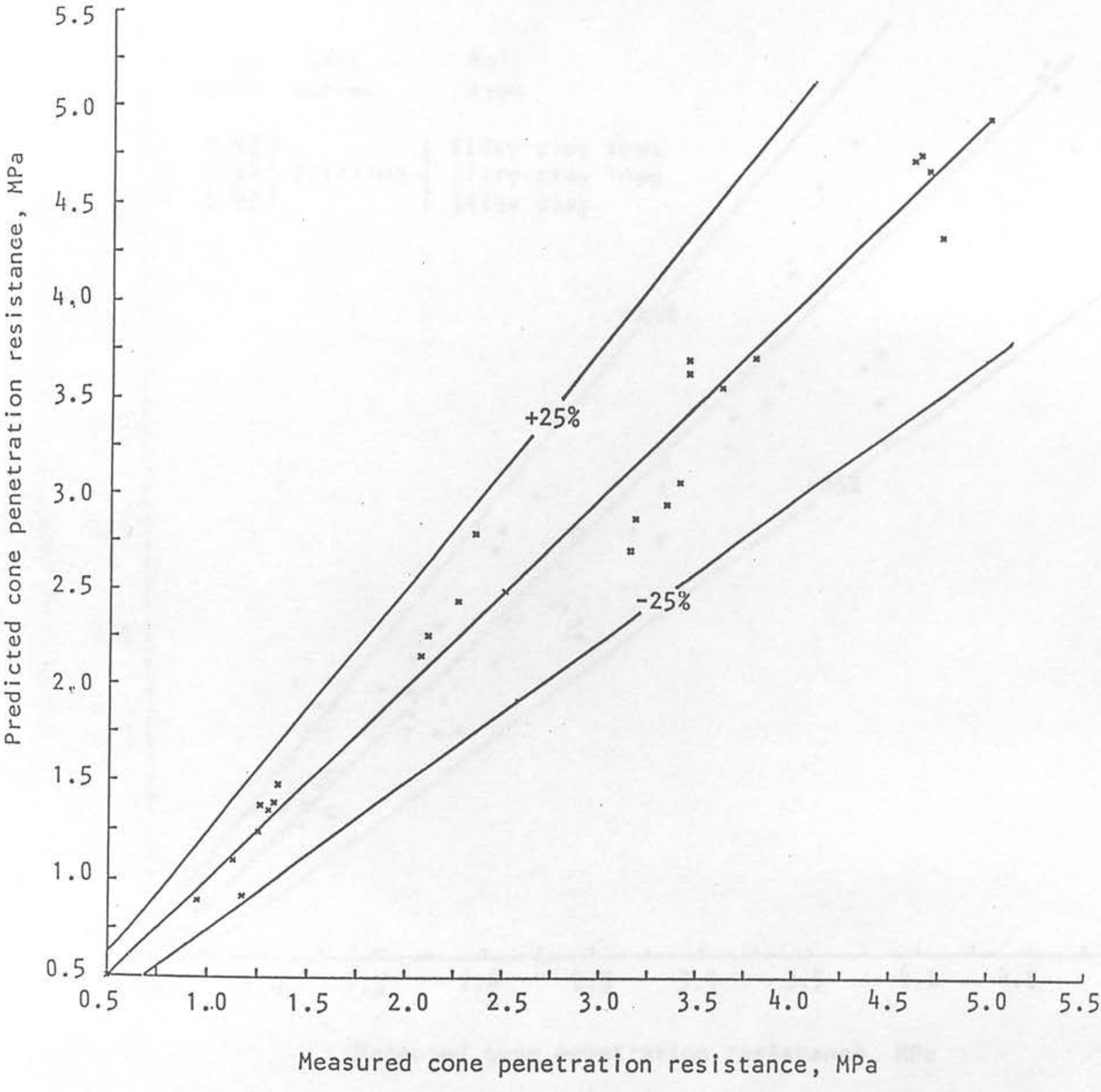


Fig 4.8 Measured and predicted values of cone penetration resistance for Stirling soil series (silty clay, clay ratio = 0.87), grass in the Stirling area.

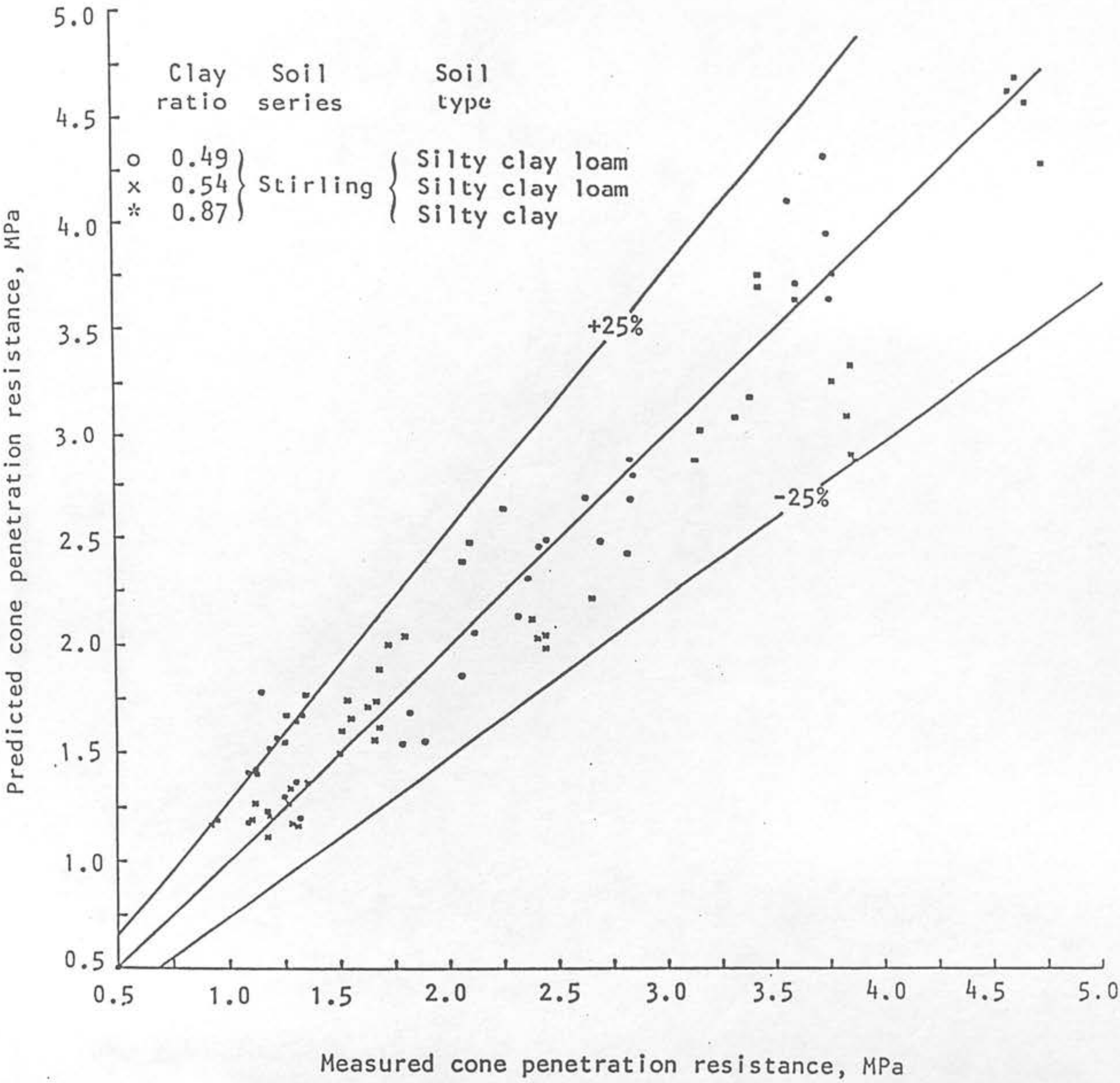


Fig 4.9 Measured and predicted values of cone penetration resistance for three soil types (surface cover: undersown, stubble, and grass) in the Stirling area.

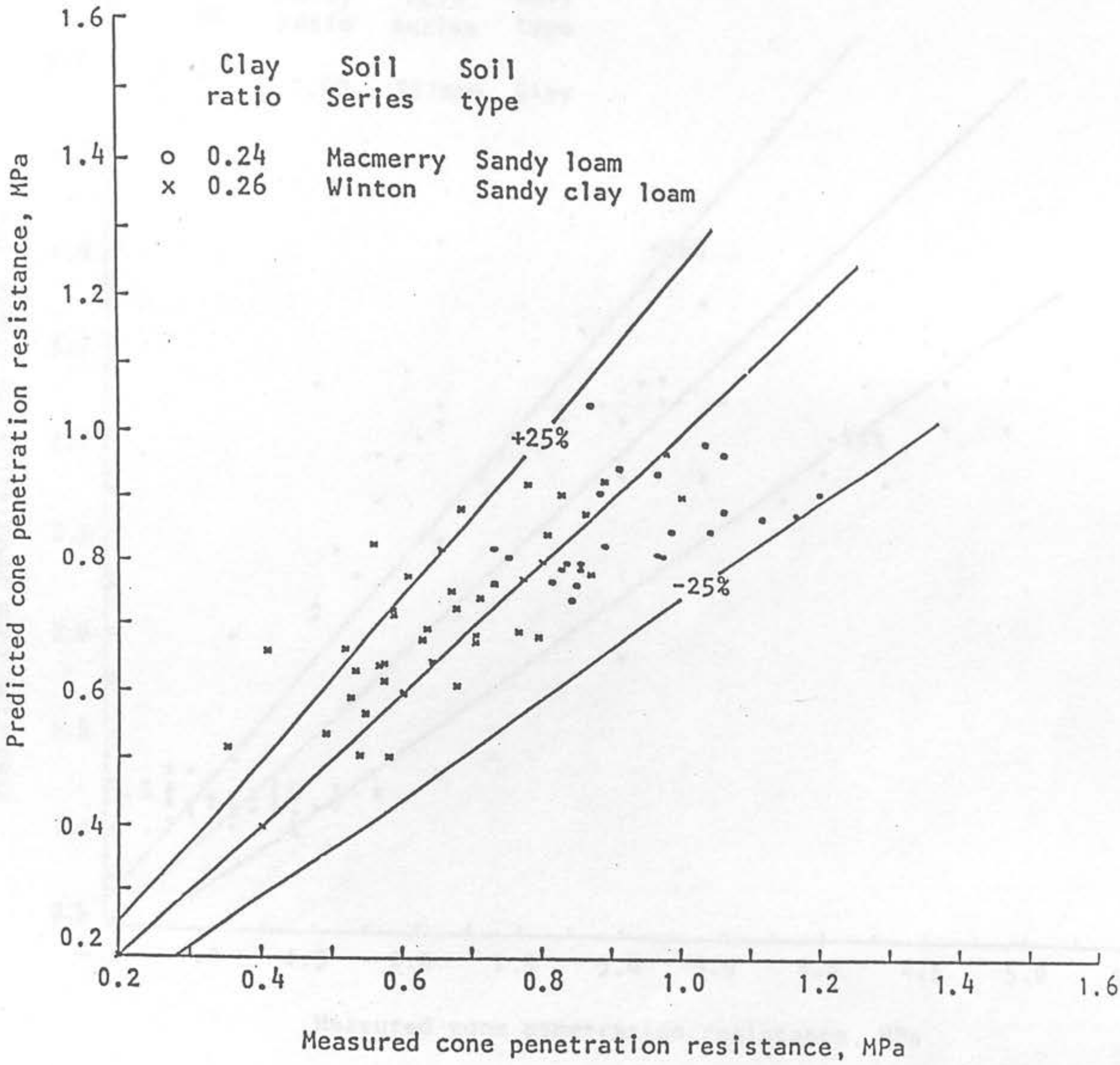


Fig 4.10 Measured and predicted values of cone penetration resistance for two soil types, Eradat Oskoui and Witney data, 1982.

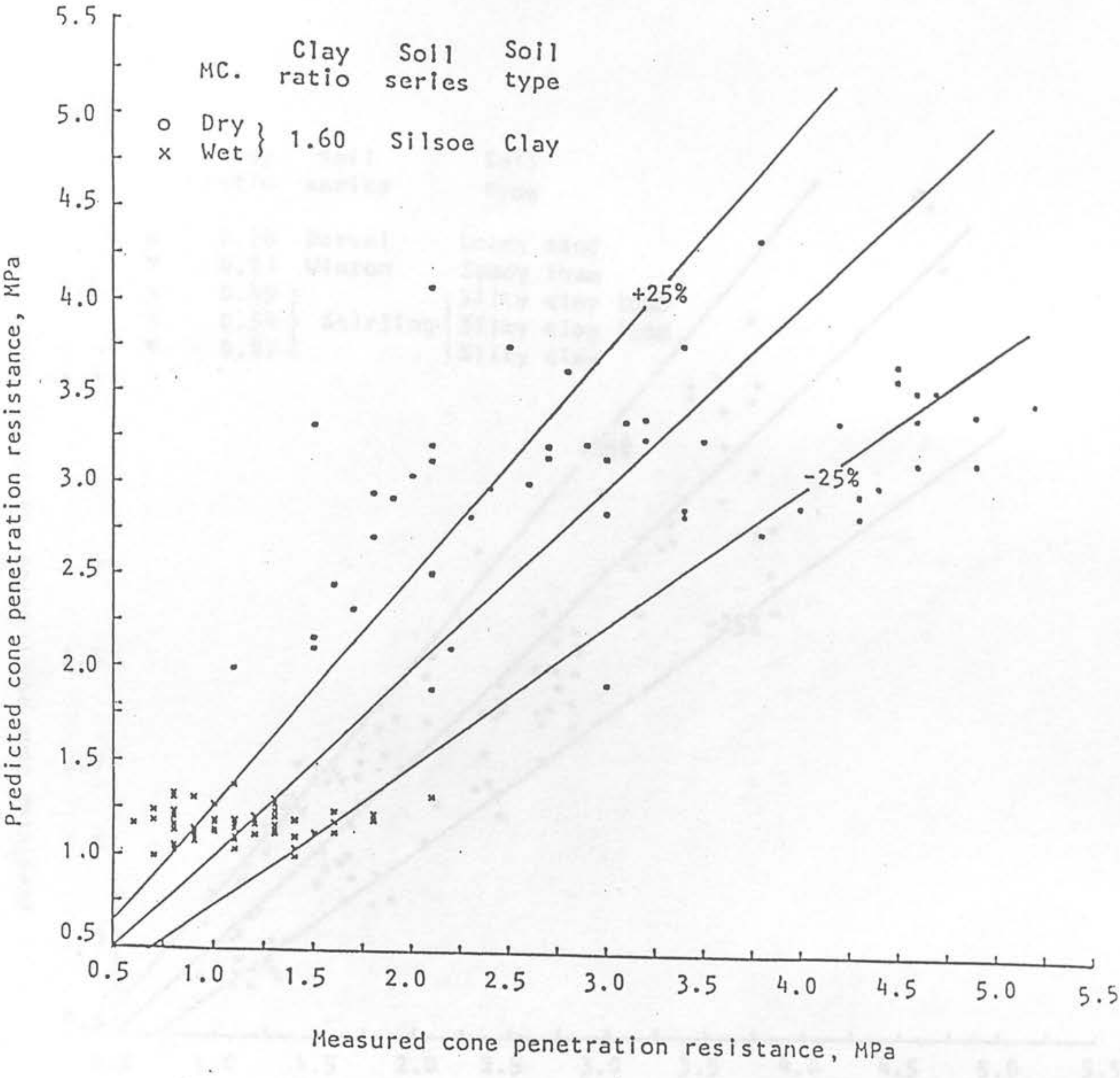


Fig 4.11 Measured and predicted values of cone penetration resistance for Silsoe soils series, Stafford data, 1984.

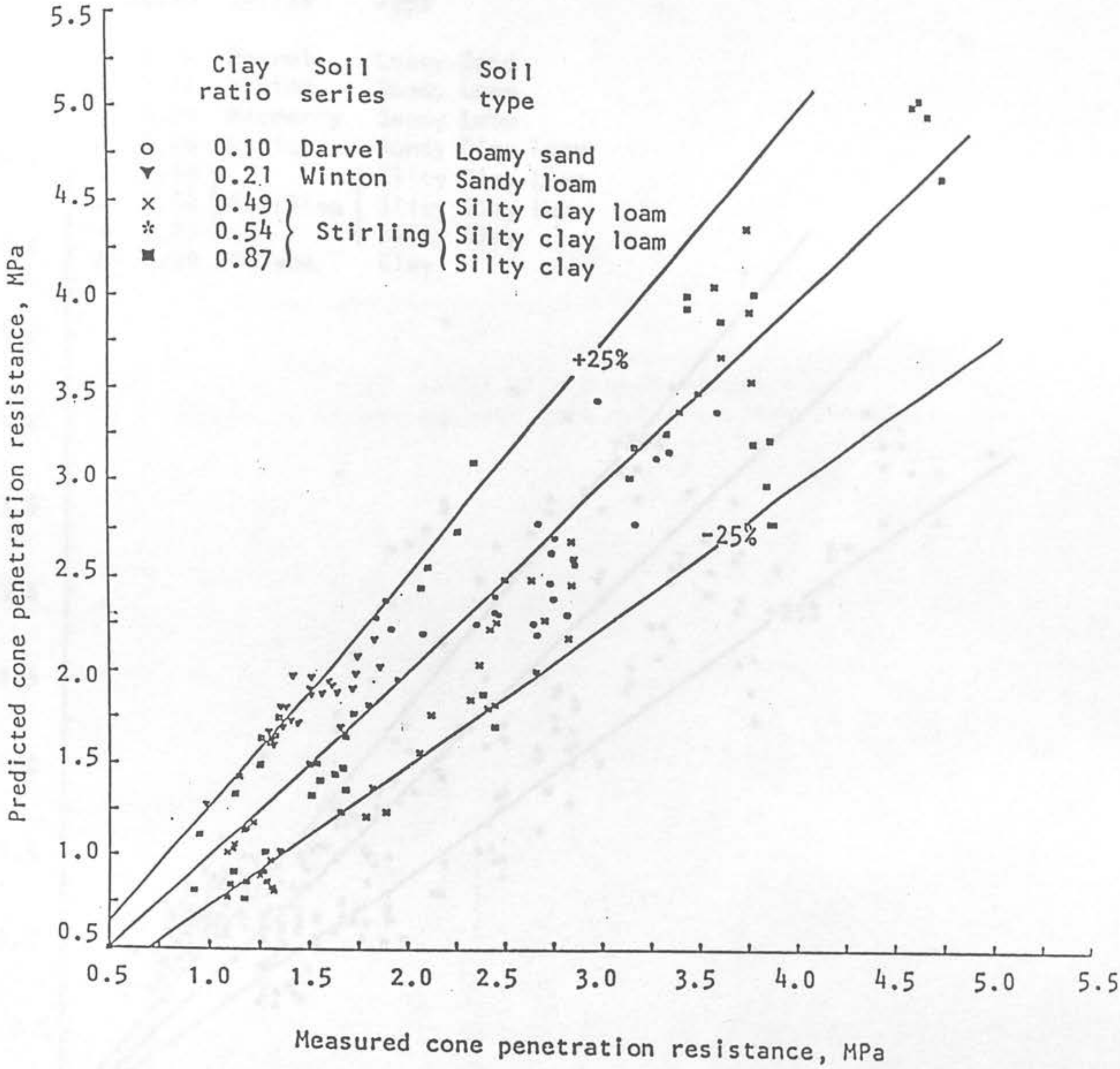


Fig 4.12 Measured and predicted values of cone penetration resistance for five soil types (surface cover: grass, stubble; undersown, stubble and grass) at Bush Estate and Stirling area.

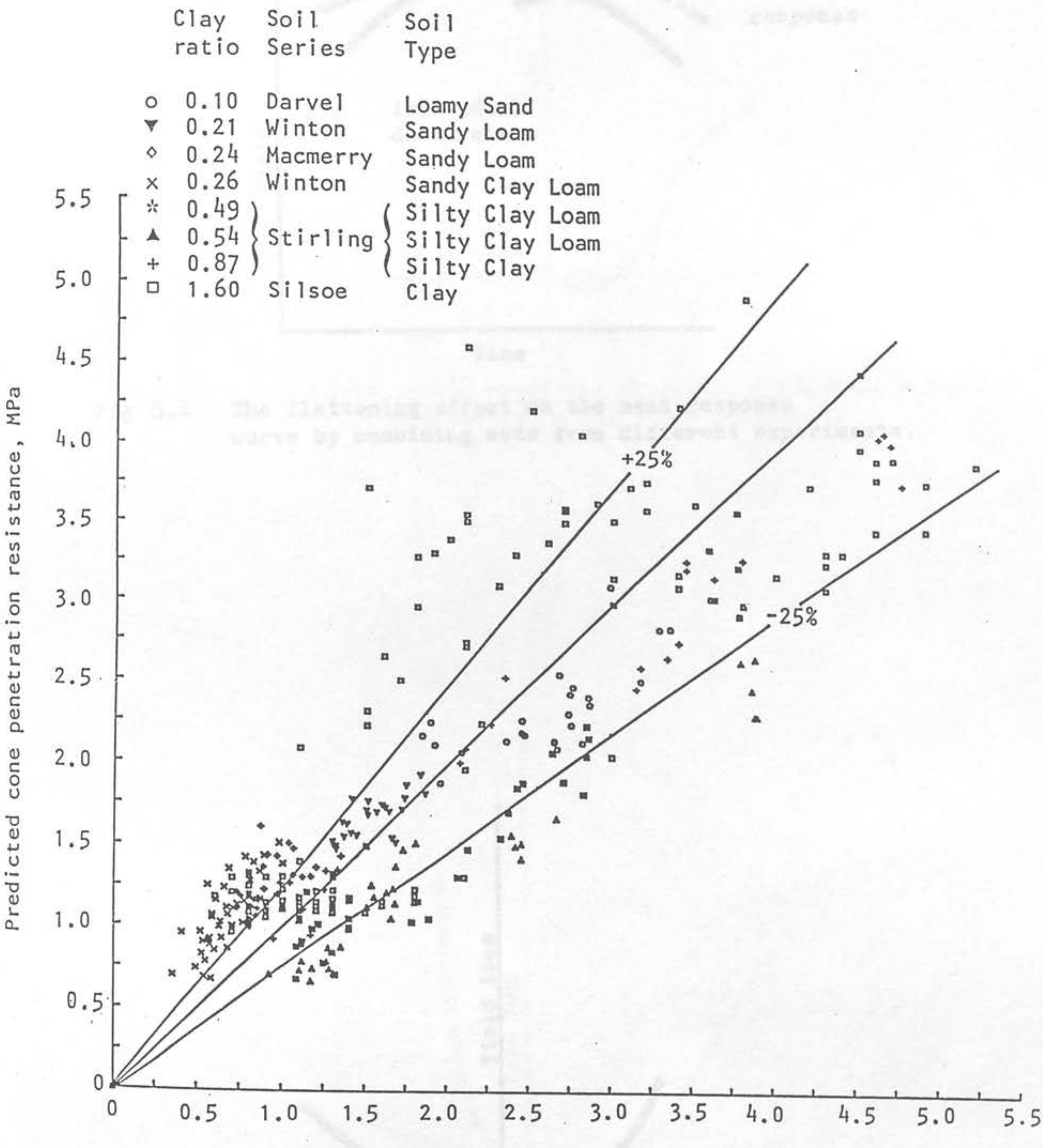


Fig 4.13 Measured and predicted values of cone penetration resistance for eight soil types at Bush, Stirling and Silsoe.

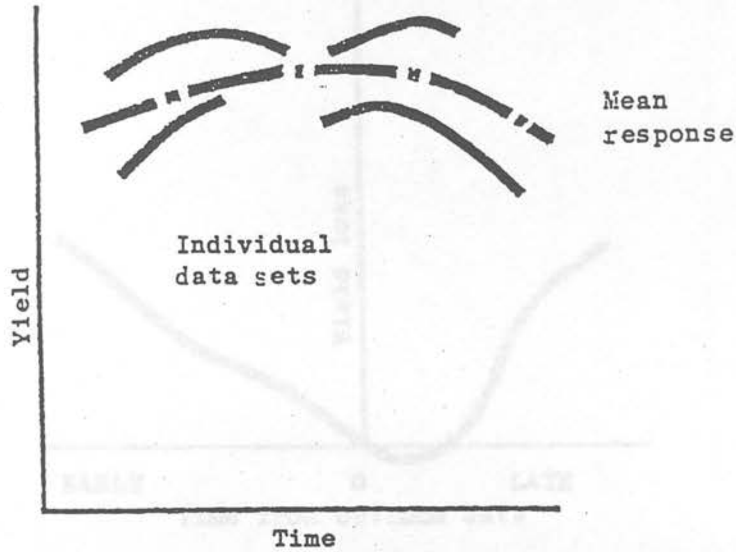


Fig 5.1 The flattening effect on the mean response curve by combining sets from different experiments.

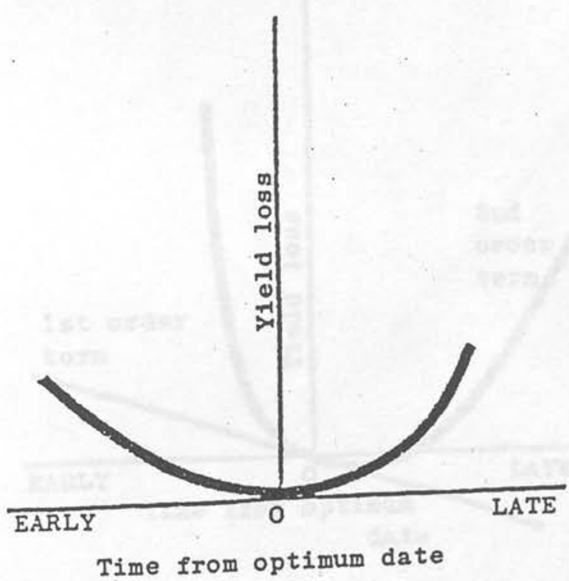


Fig 5.2 The general form of the yield loss curve normalised for time from the optimum date of establishment.

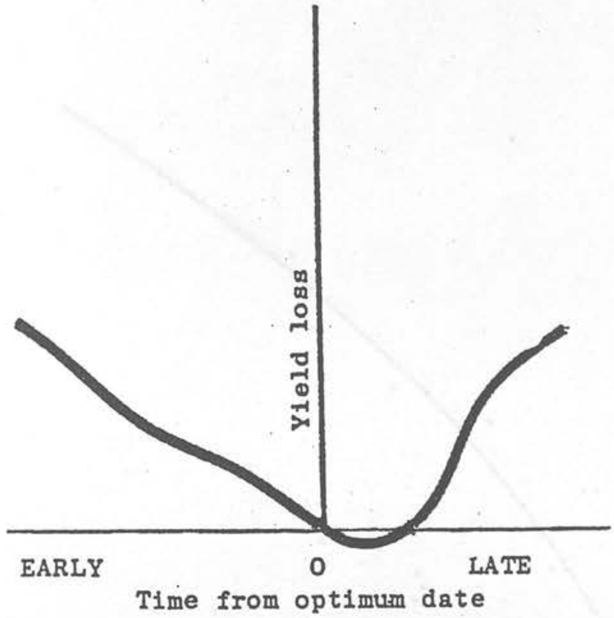


Fig 5.3 The questionable practical validity of adopting a complex waveform generated by a 5th order polynomial.

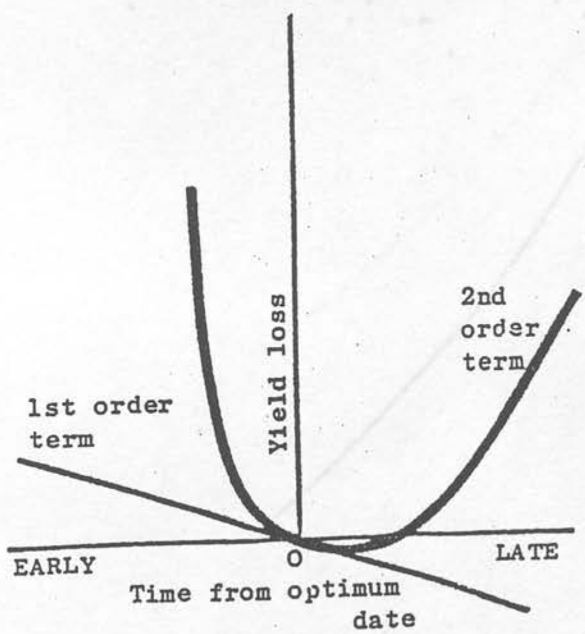


Fig 5.4 Negative yield losses (yield gains) generated by the assymmetry of the 1st order term.

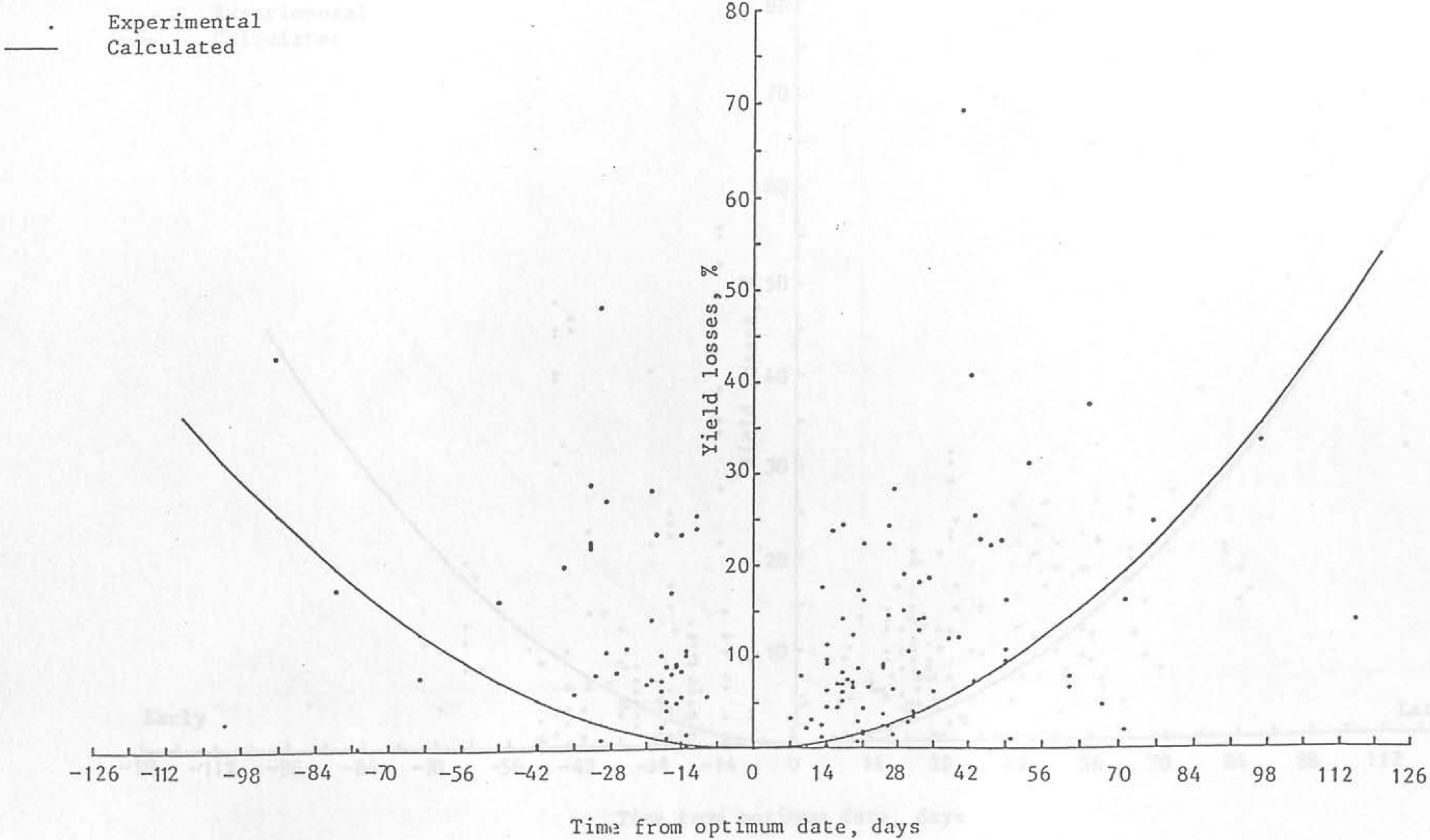


Fig 5.5 Winter barley: percentage yield losses from untimely establishment

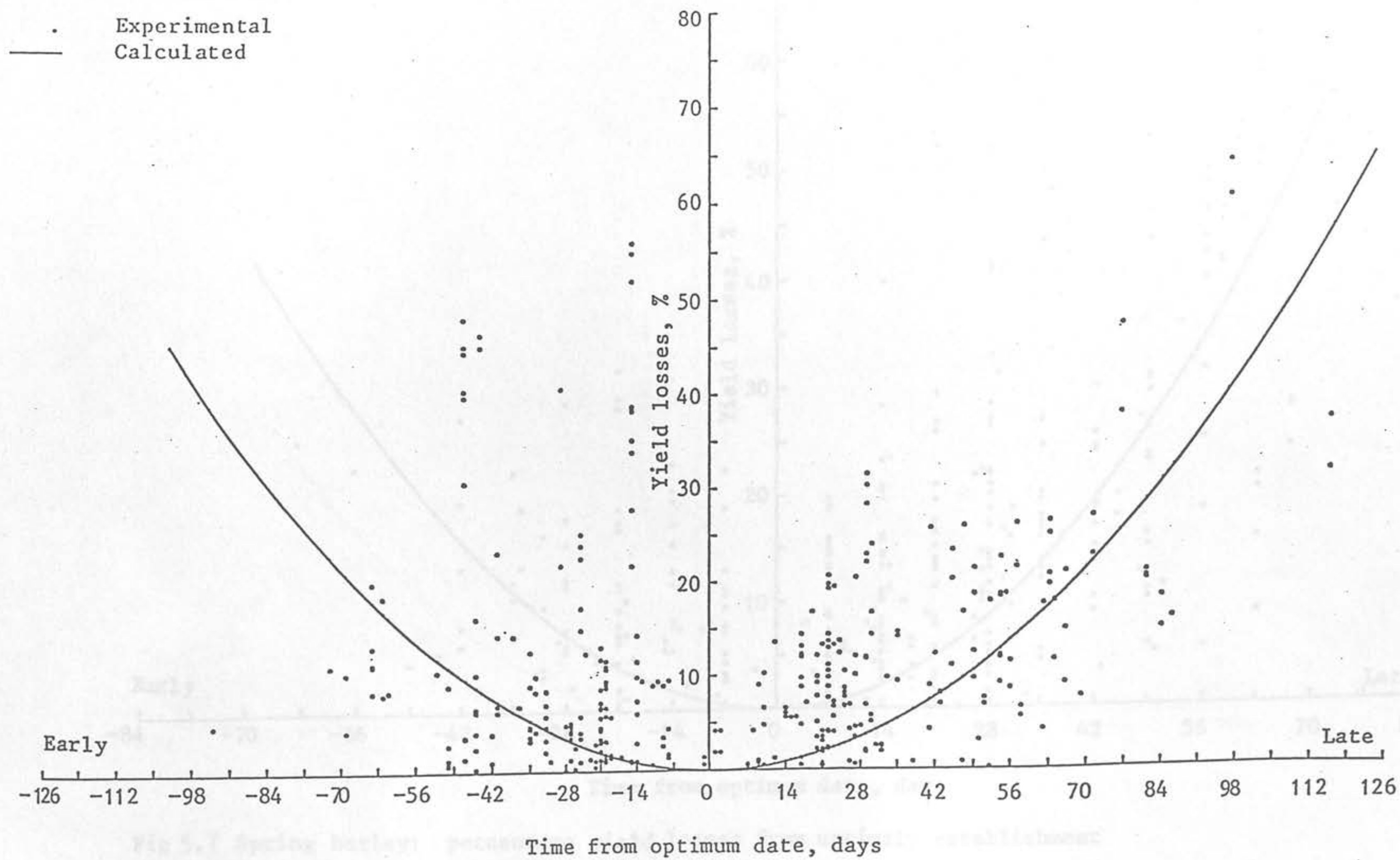


Fig 5.6 Winter wheat: percentage yield losses from untimely establishment

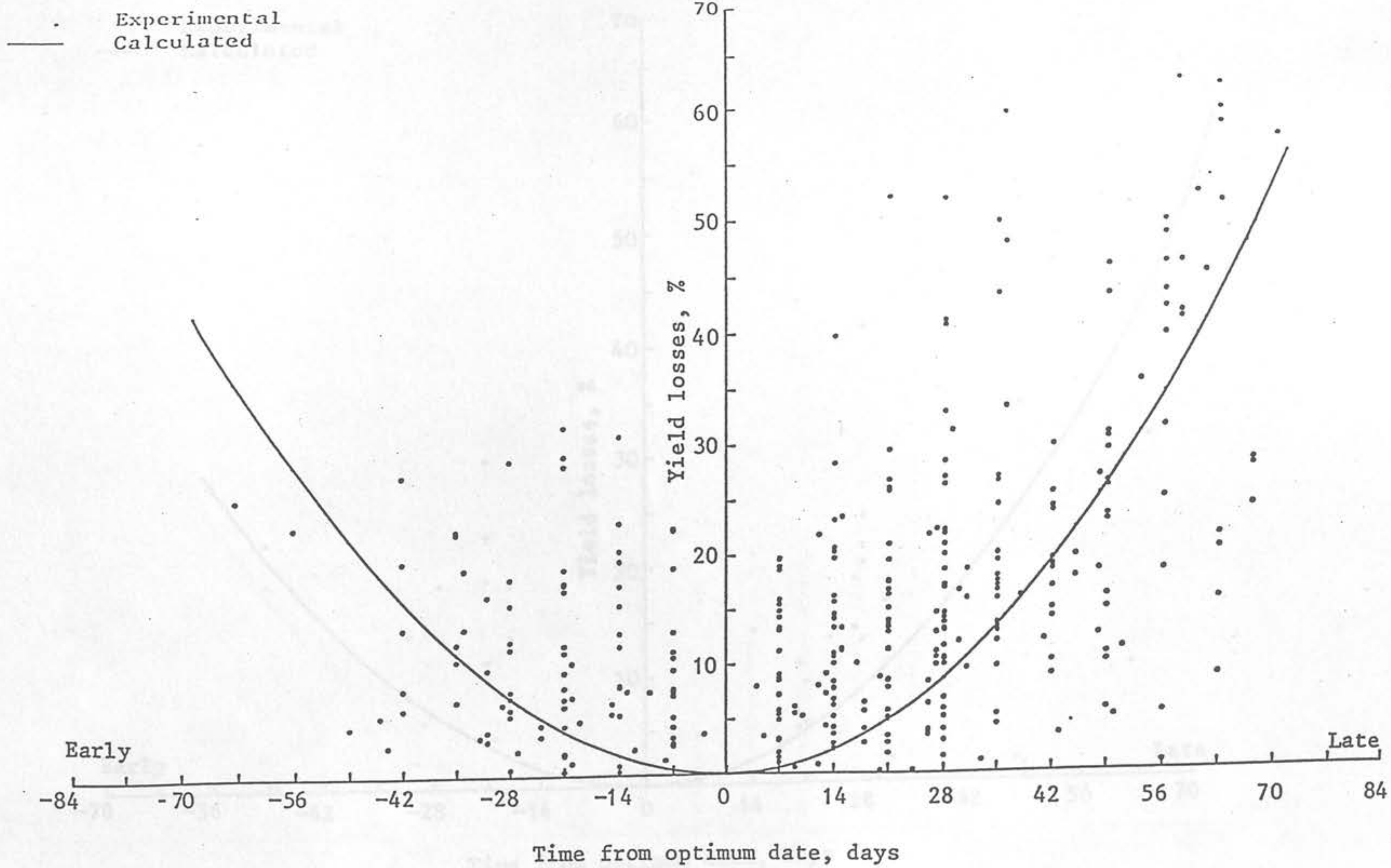


Fig 5.7 Spring barley: percentage yield losses from untimely establishment

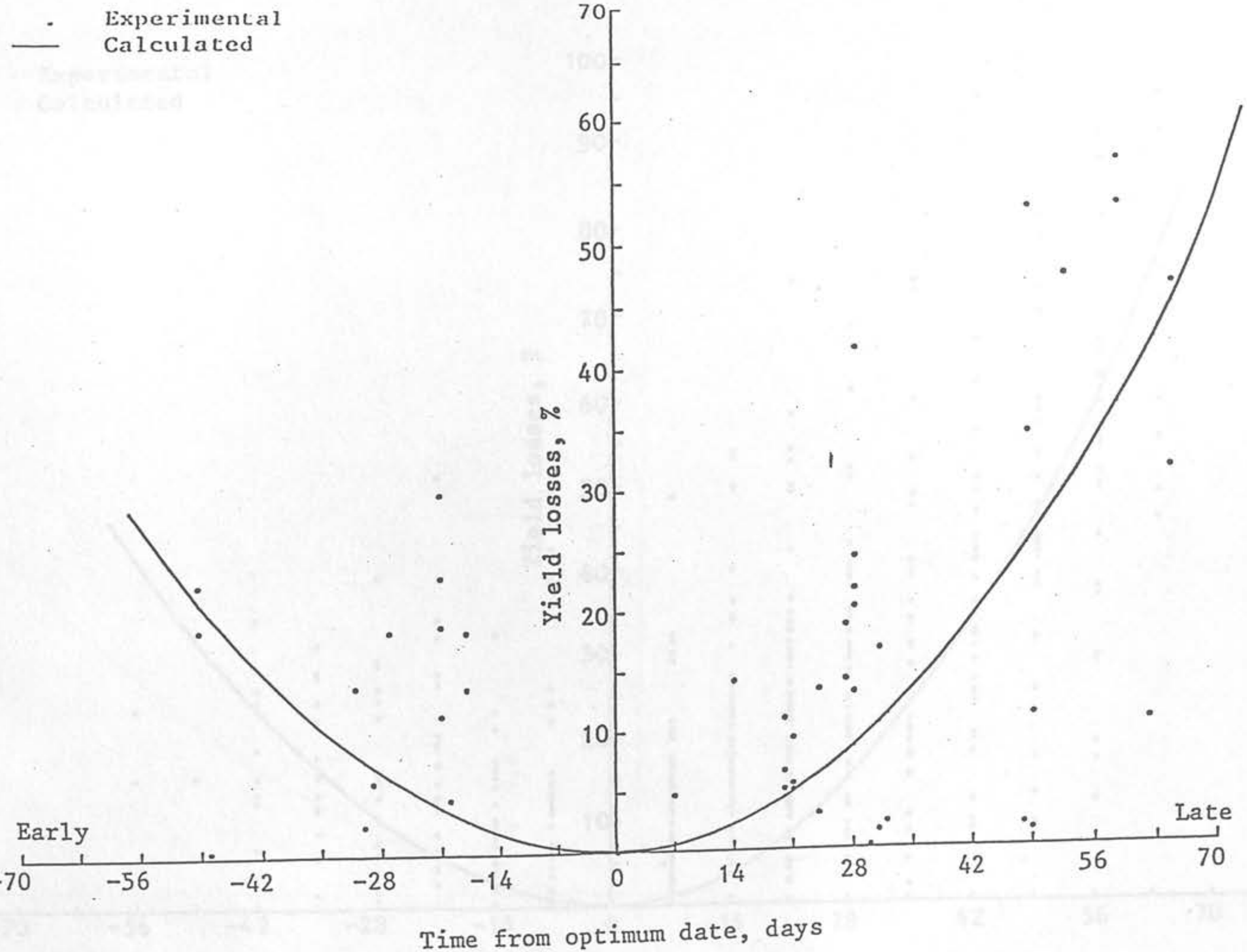


Fig 5.8 Spring wheat: percentage yield losses from untimely establishment

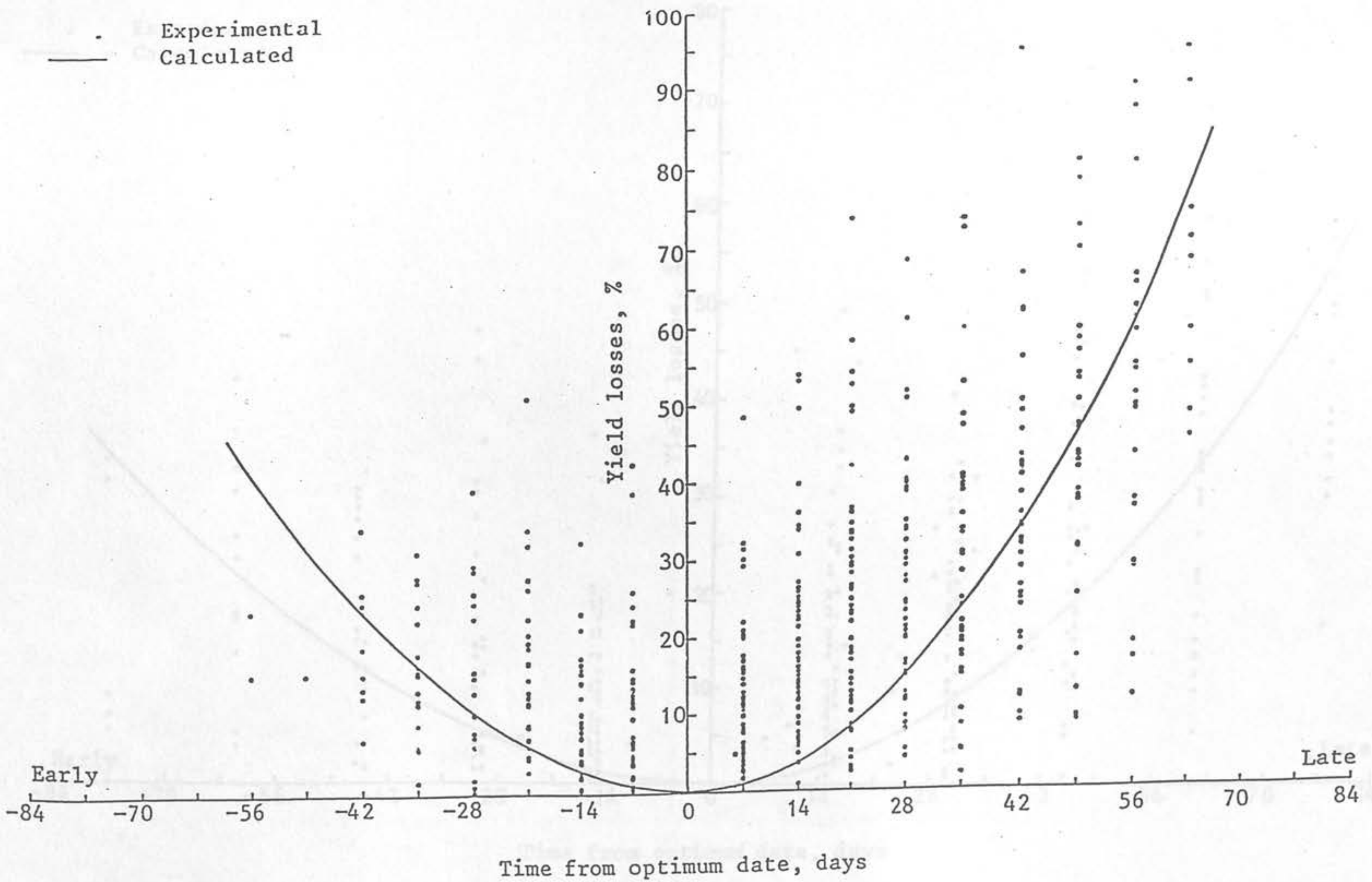


Fig 5.9 Oats: percentage yield losses from untimely establishment

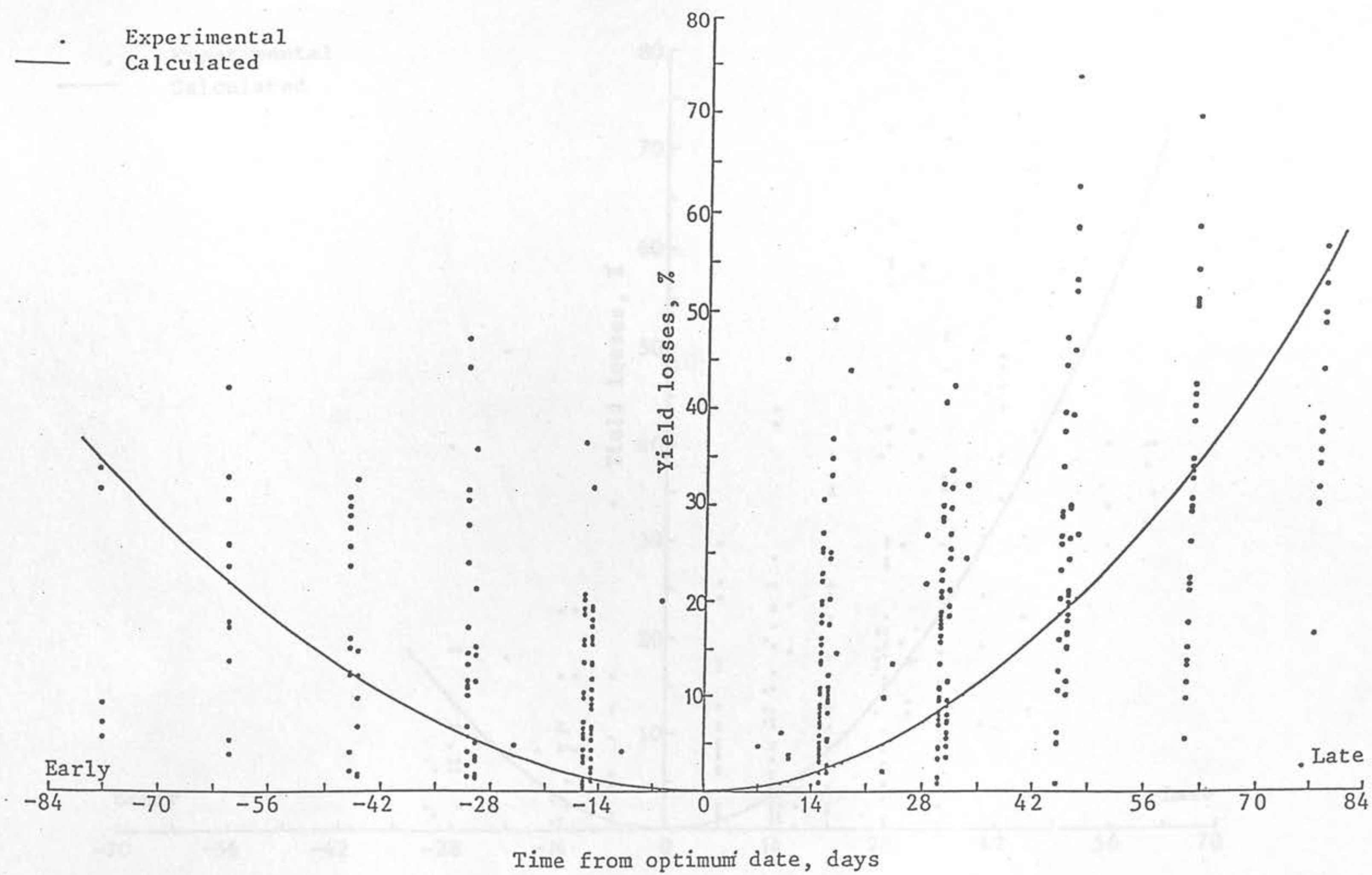


Fig 5.10 Potatoes: percentage yield losses from untimely establishment

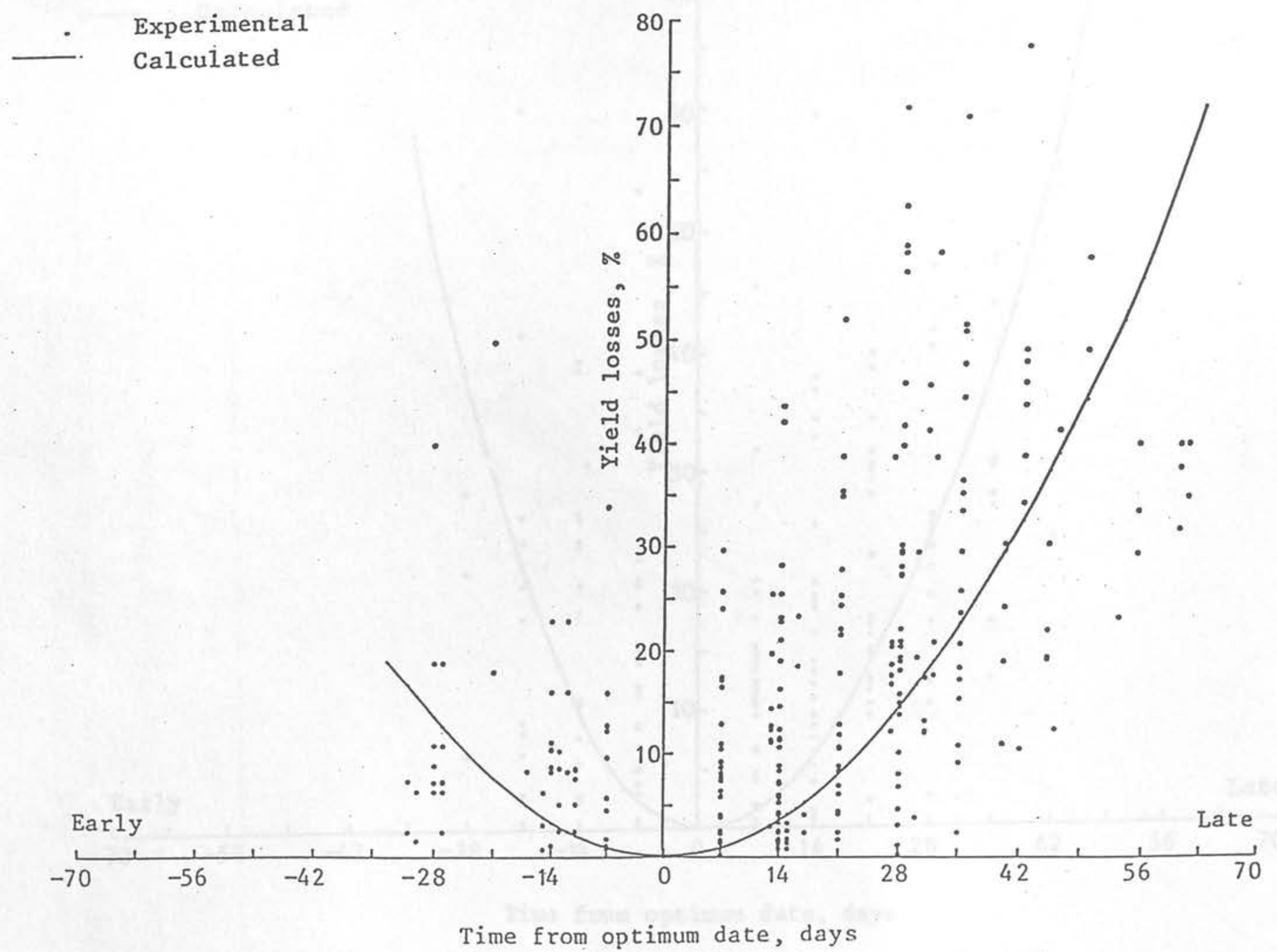


Fig 5.11 Swedes: percentage yield losses from untimely establishment

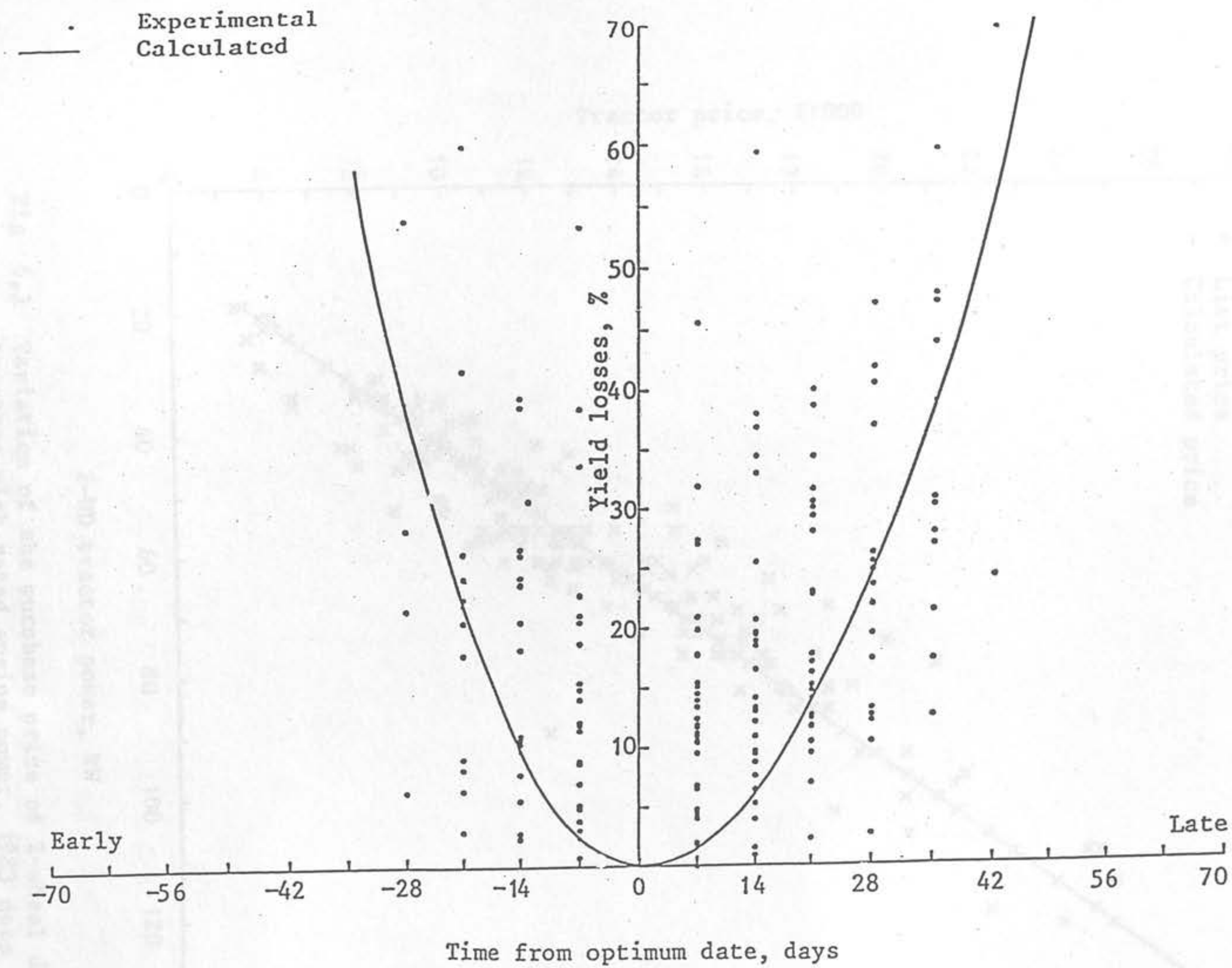


Fig 5.12 Turnips: percentage yield losses from untimely establishment

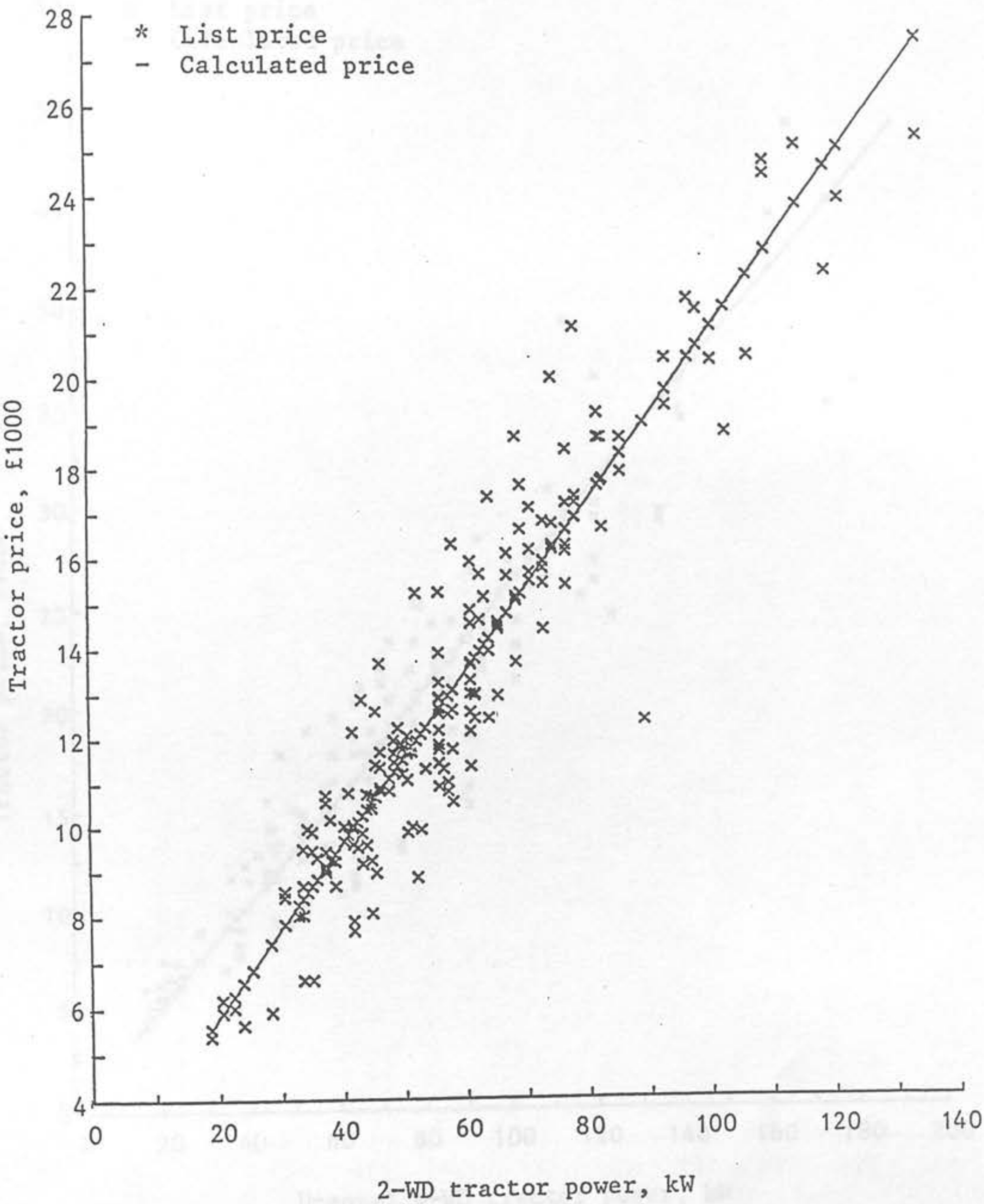


Fig 6.1 Variation of the purchase price of 2-wheel drive tractors with rated engine power, 1983 data

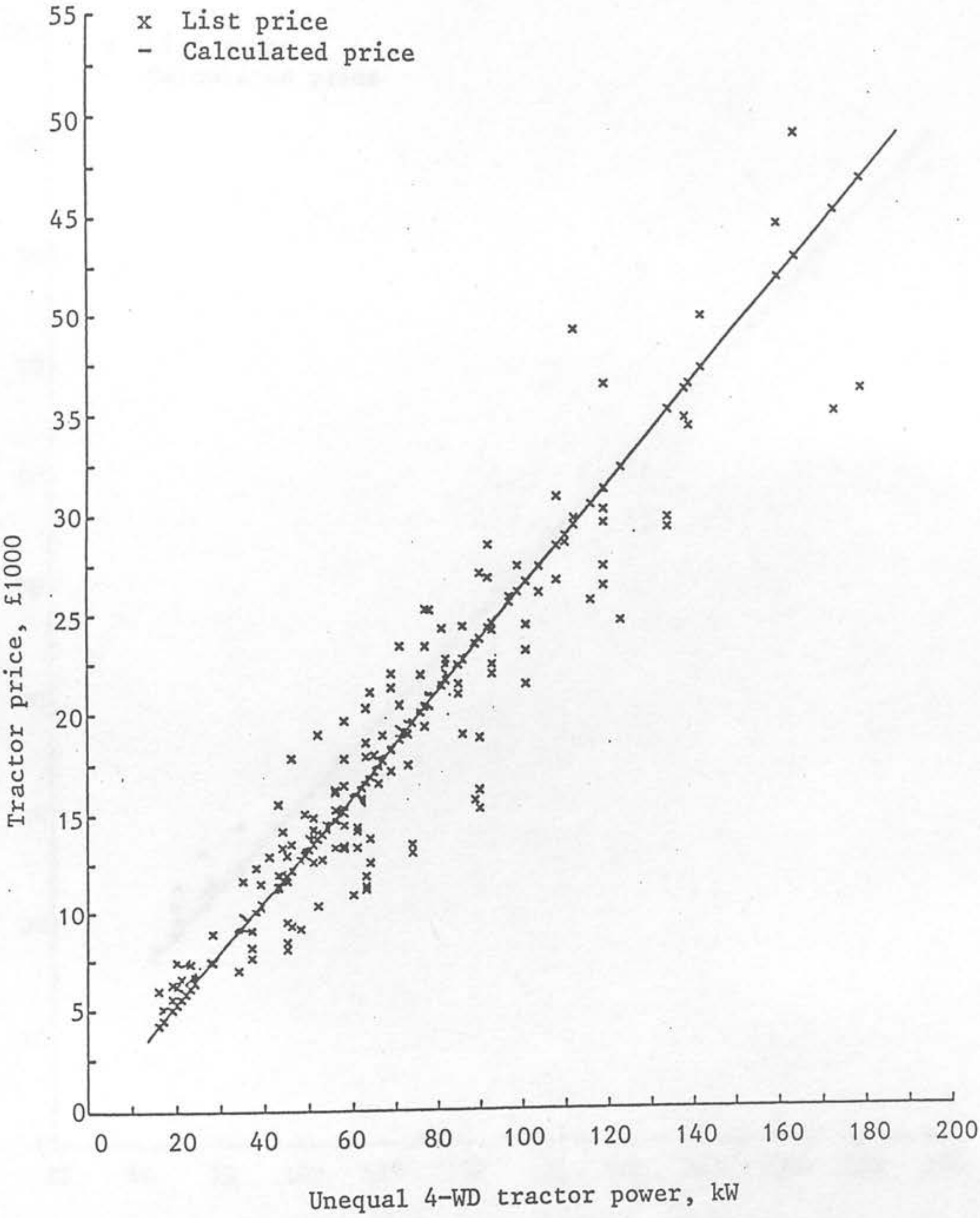


Fig 6.2 Variation of the purchase price of unequal 4-wheel drive tractors with rated engine power, 1983 data

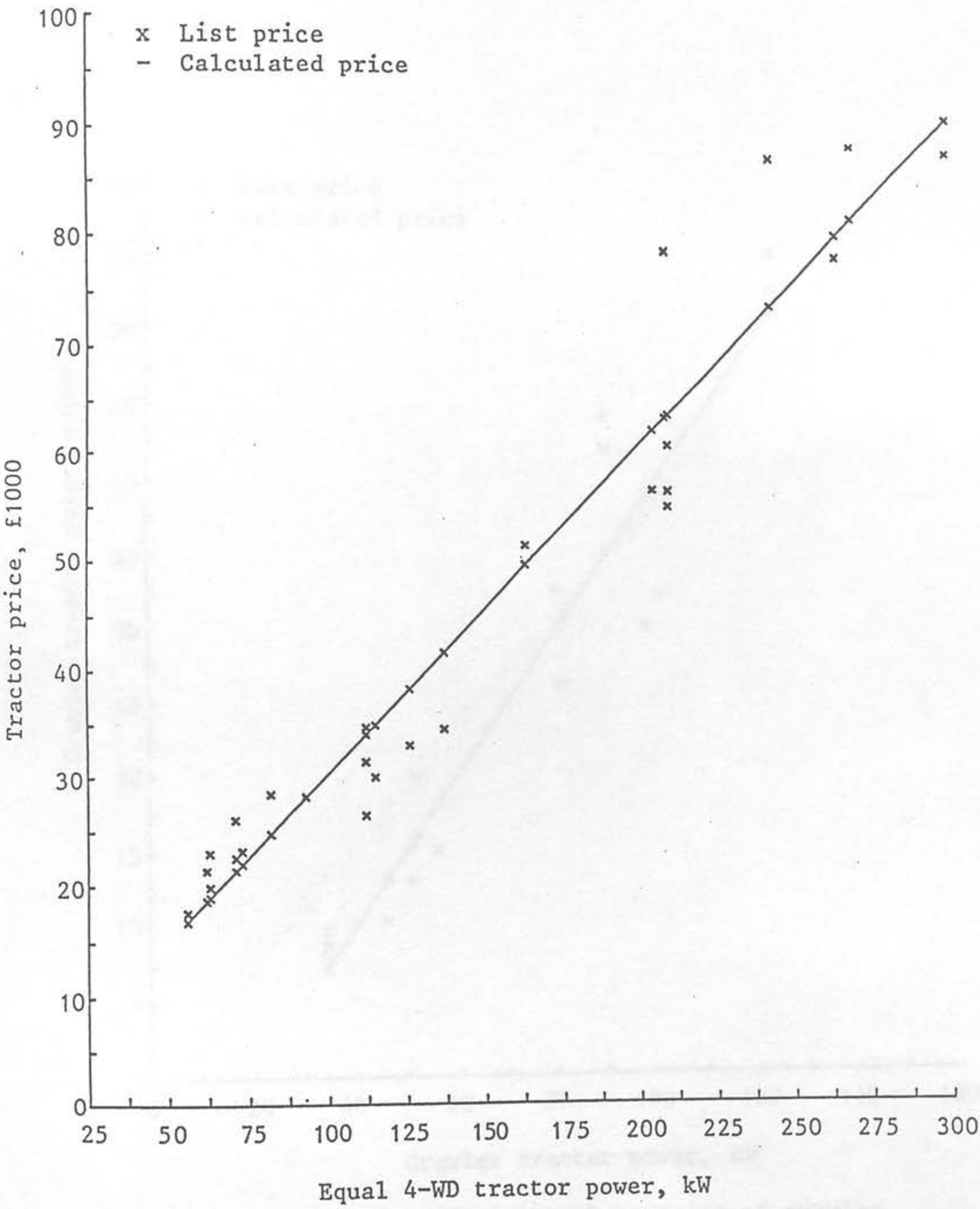


Fig 6.3 Variation of the purchase price of equal 4-wheel drive tractors with rated engine power, 1983 data

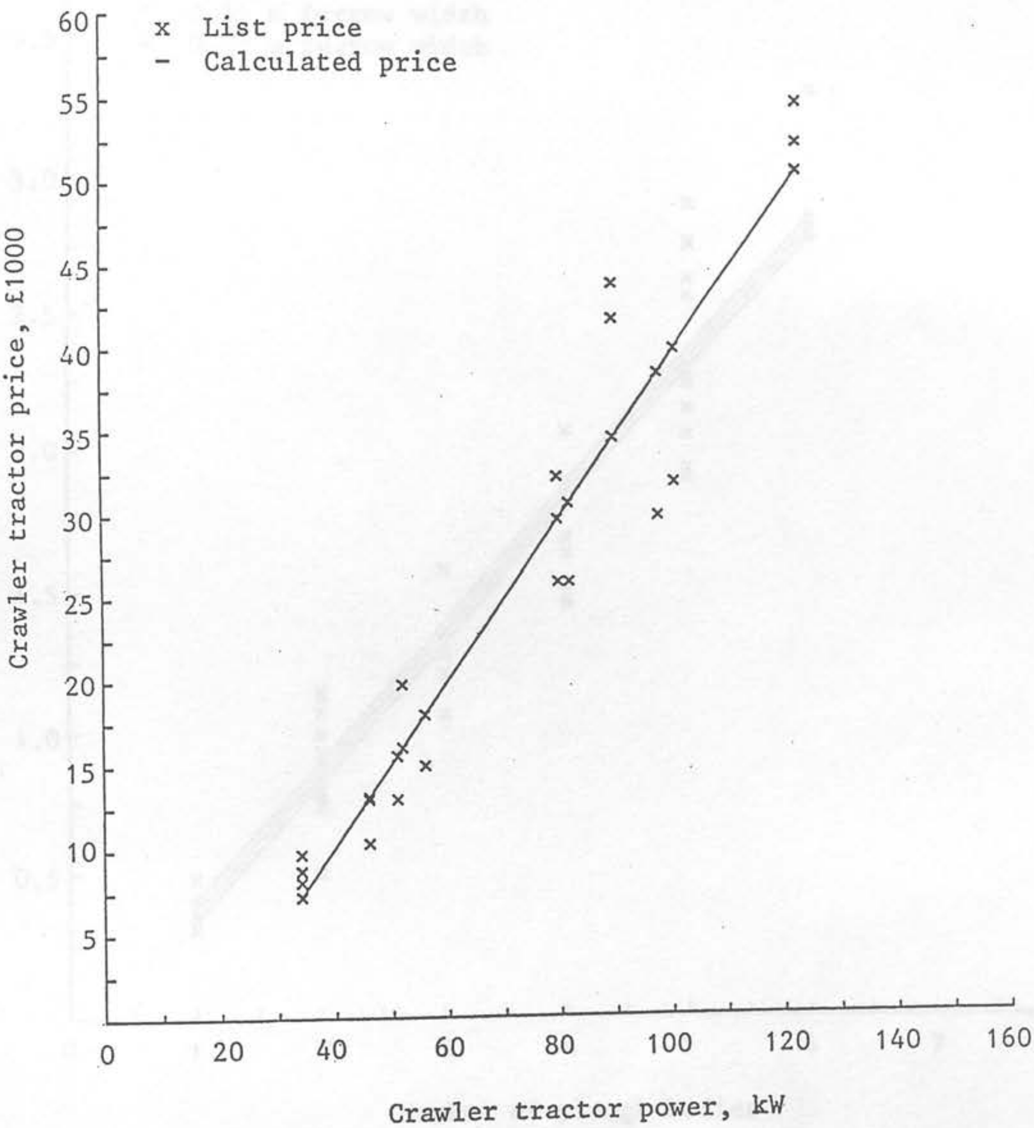


Fig 6.4 Variation of the purchase price of crawler tractors with rated engine power, 1983 data

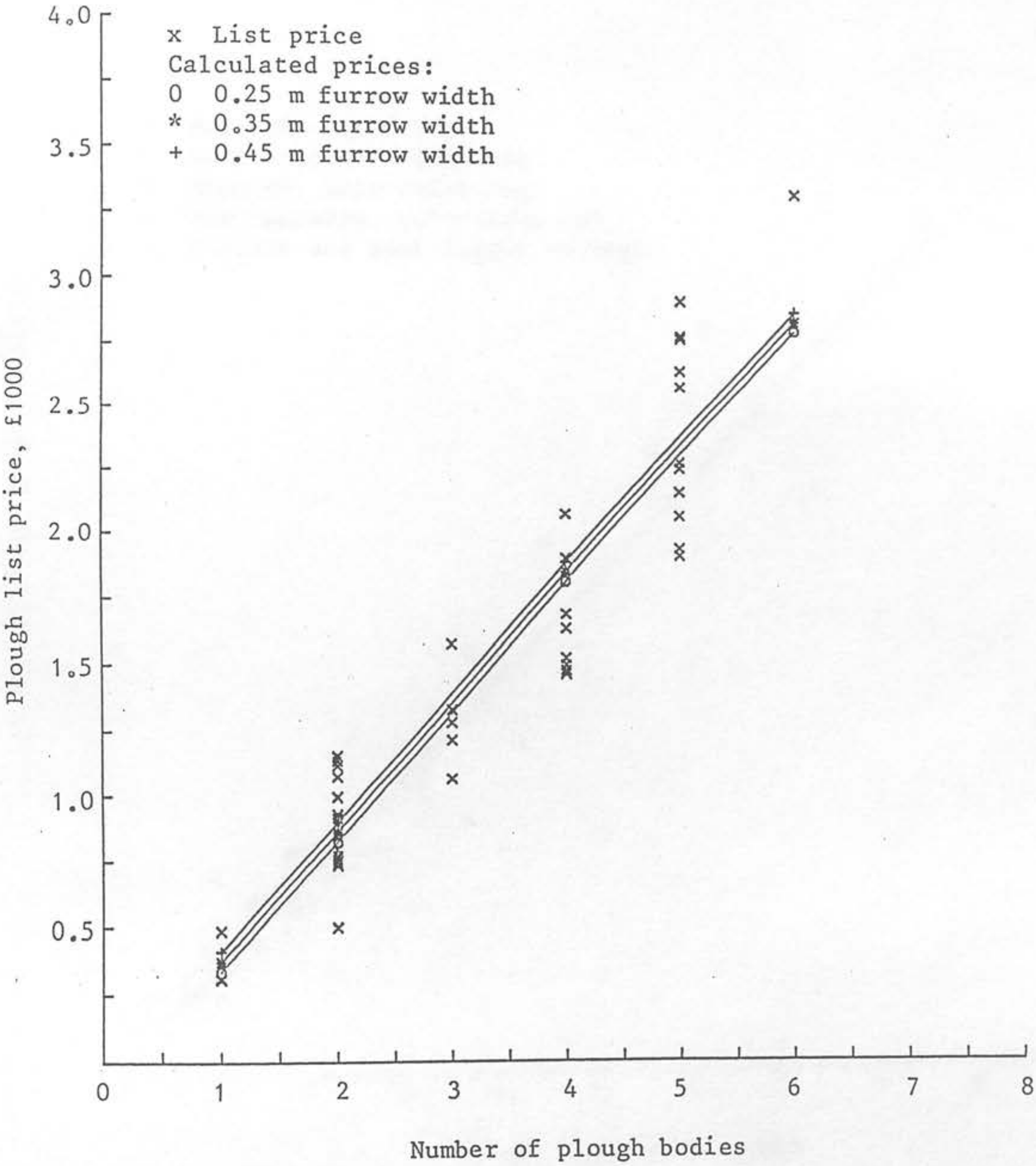


Fig 6.5 The effect of the furrow width and number of plough bodies on the price of conventional mounted ploughs, 1983 data

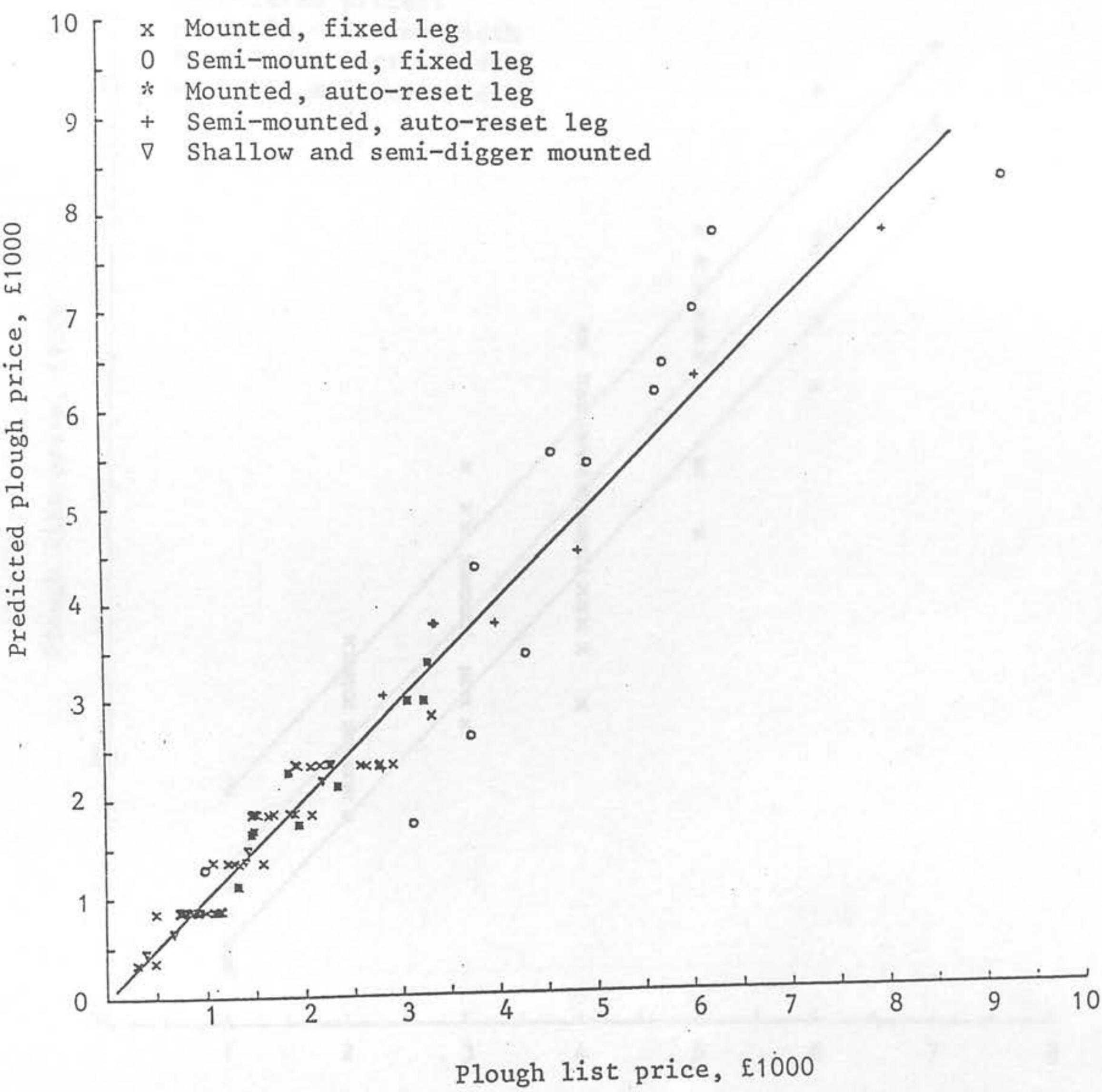


Fig 6.6 Predicted against list price of various types of conventional mounted ploughs, 1983 data

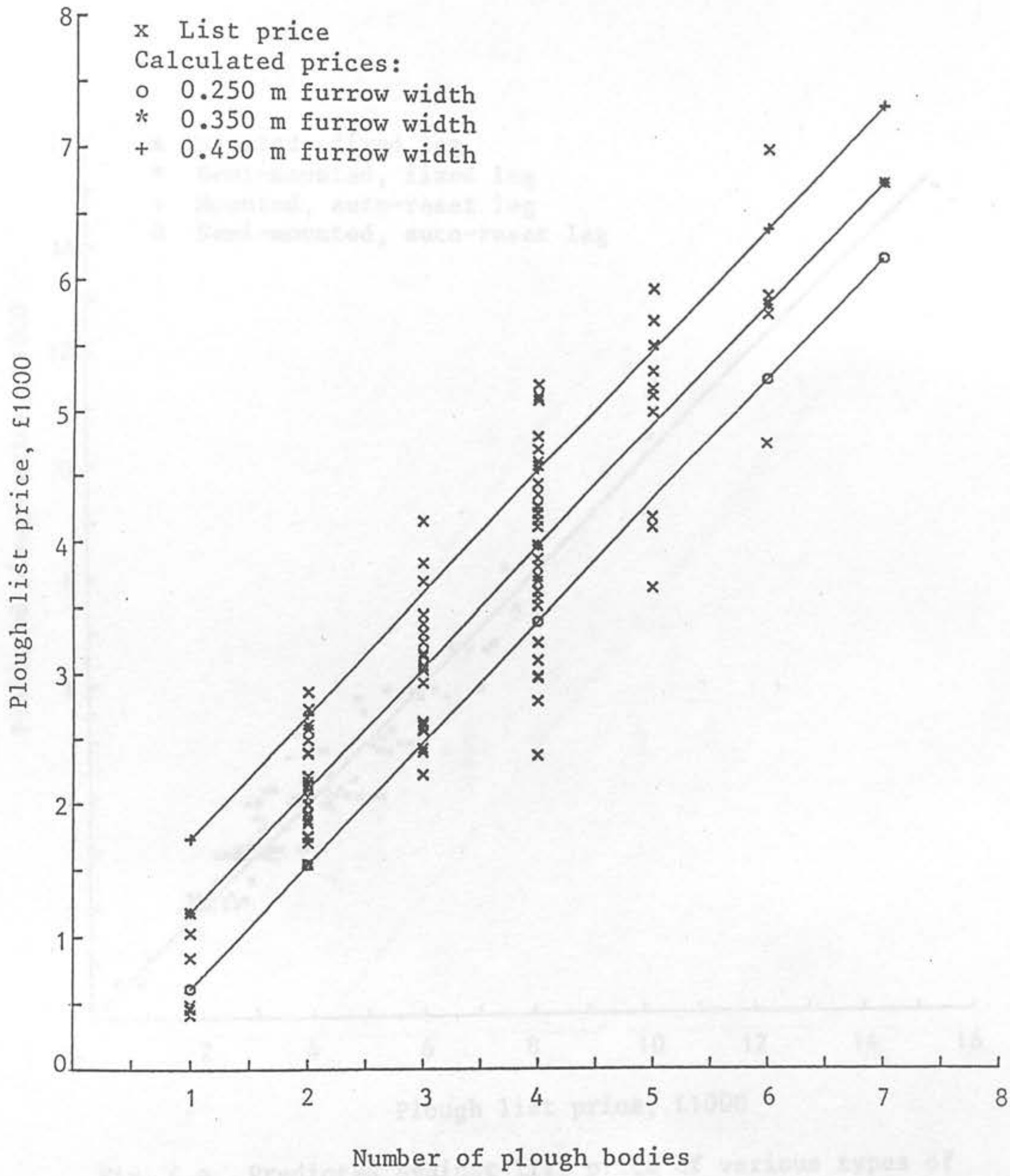


Fig 6.7 The effect of the furrow width and number of plough bodies on the price of reversible mounted ploughs, 1983 data.

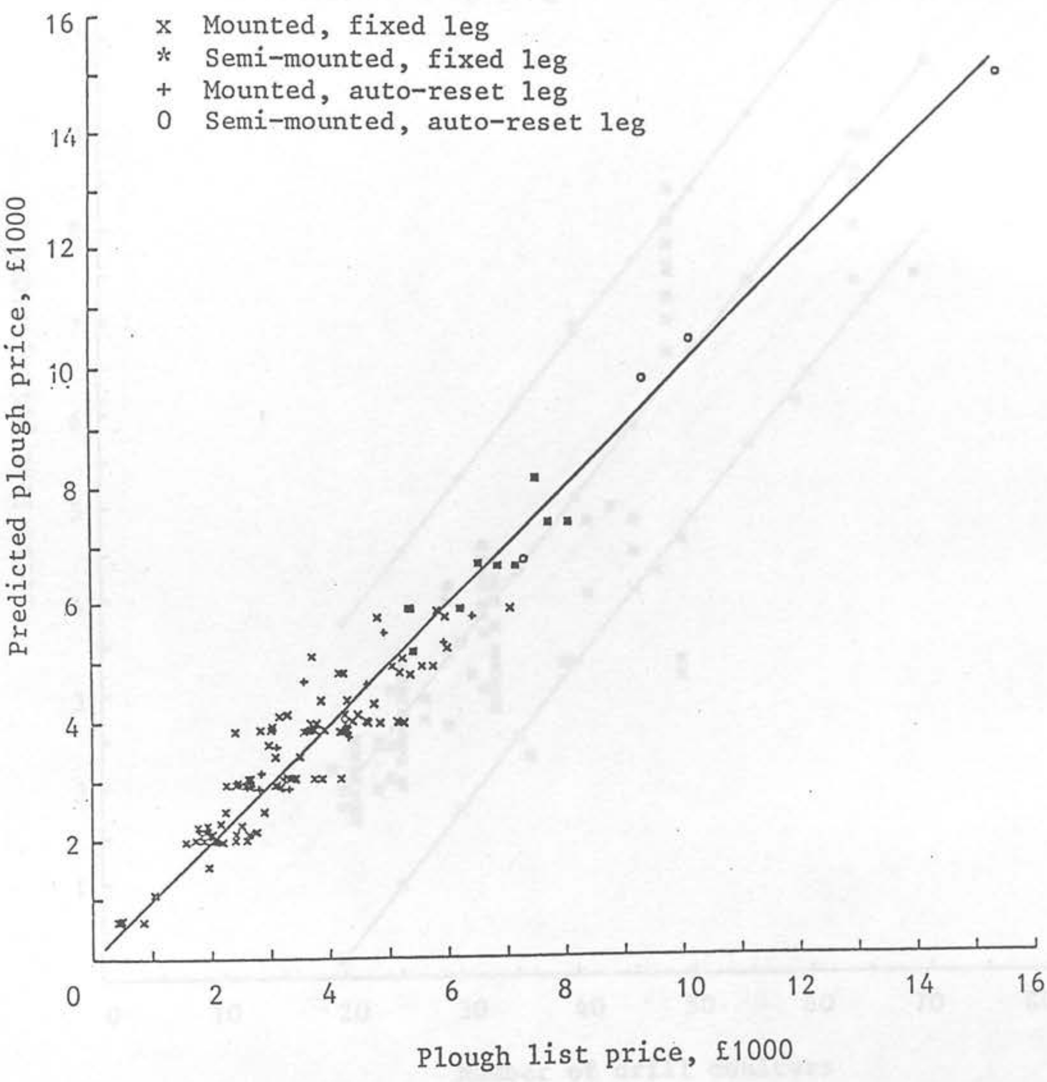


Fig 6.8 Predicted against list price of various types of reversible ploughs, 1983 data

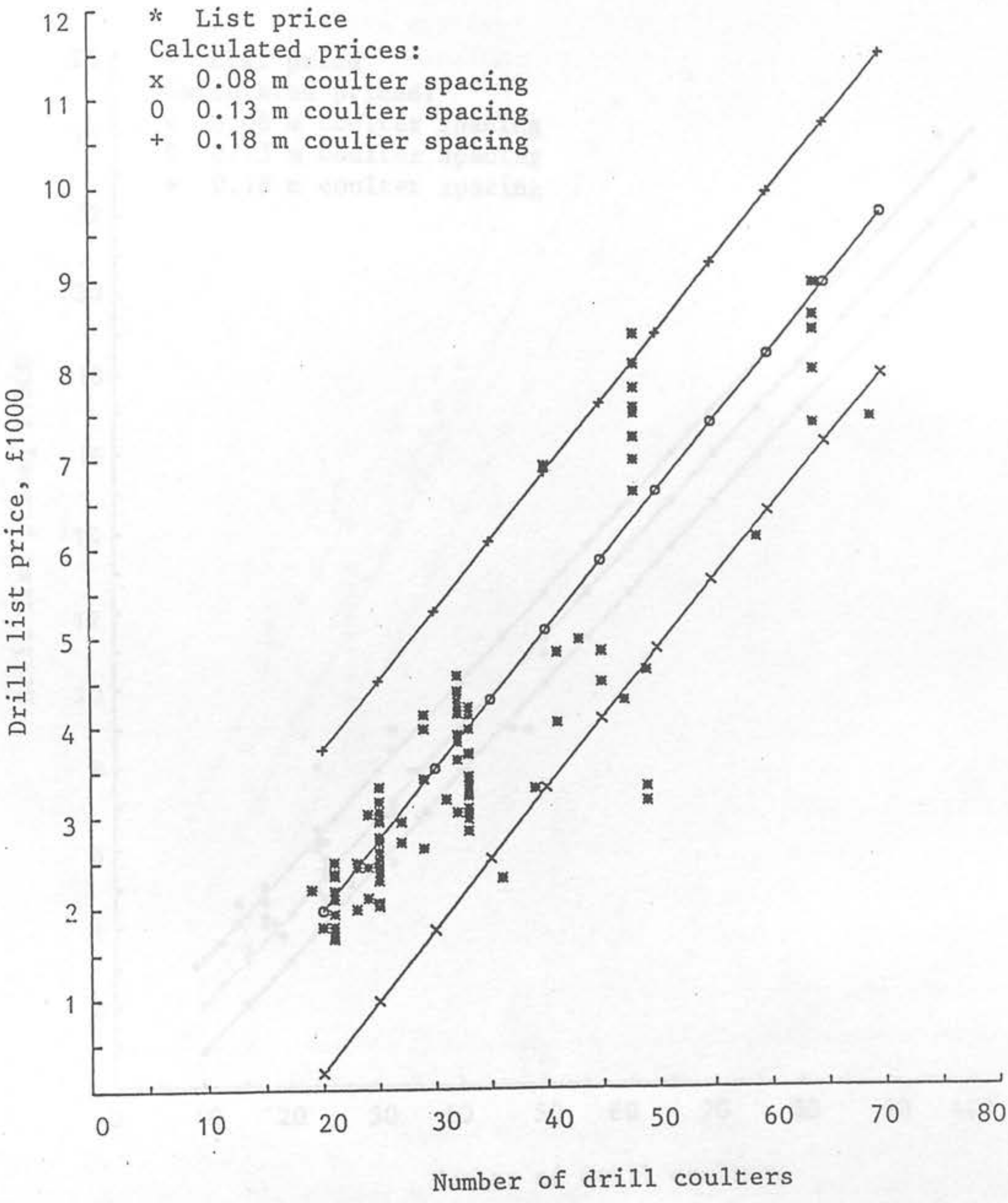


Fig 6.9 The effect of number of coulters and coulter spacing on the price of mounted, grain only drills, 1984 data

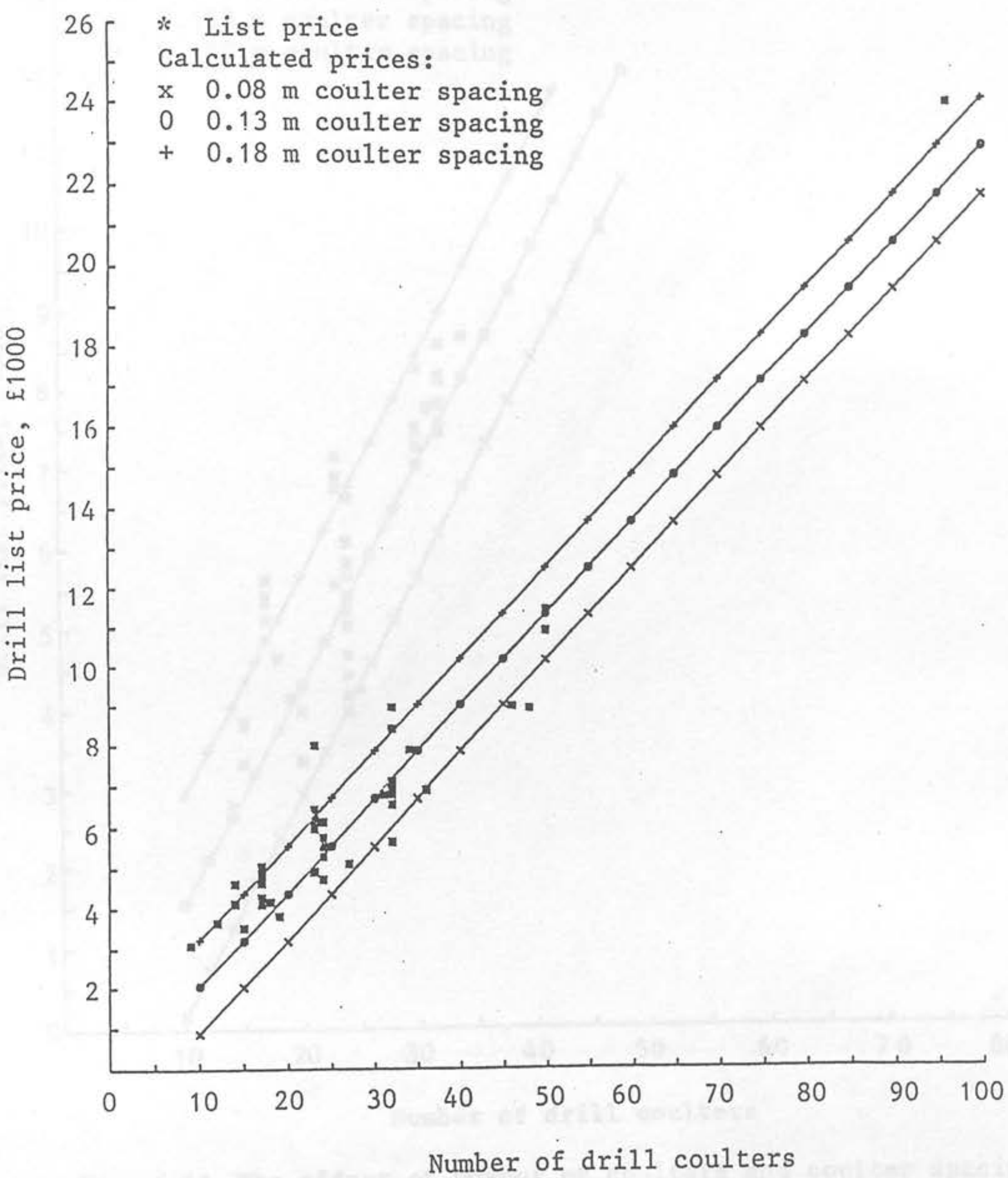


Fig 6.10 The effect of number of coulters and coulter spacing on the price of trailed, grain only drills, 1984 data

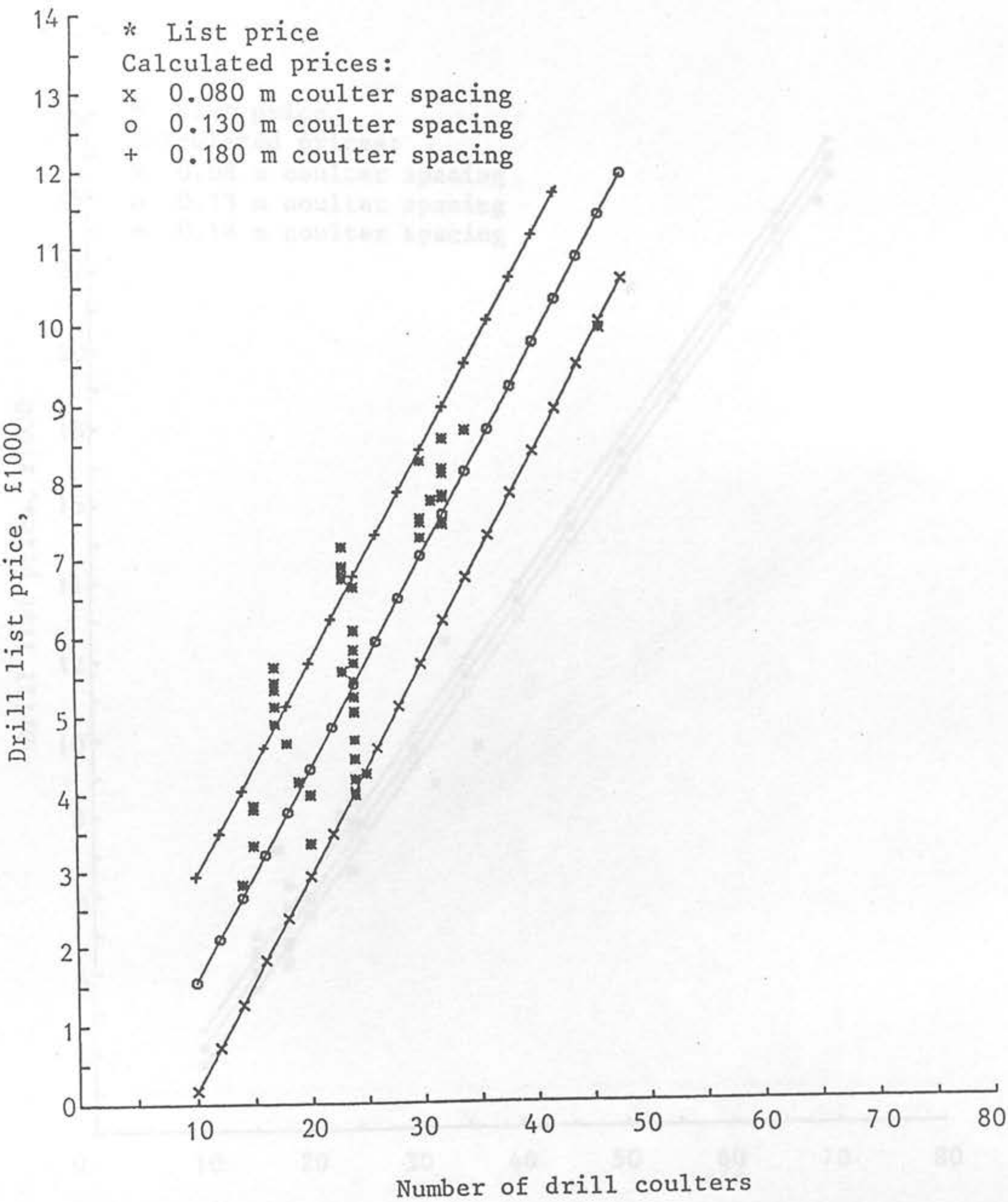


Fig 6.11 The effect of number of coulters and coulter spacing on the price of trailed combine drills (grain and fertilized) 1984 data

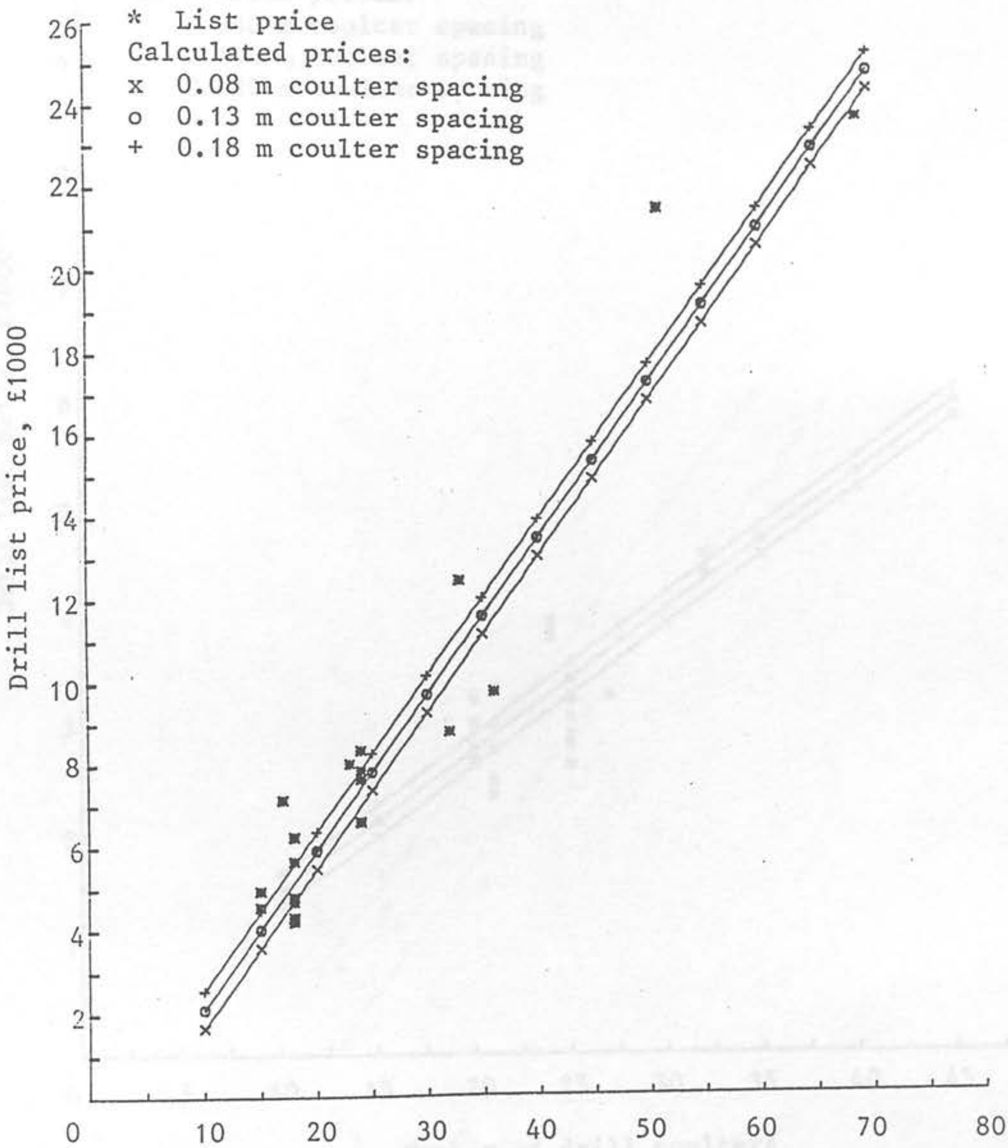


Fig 6.12 The effect of number of coulters and coulter spacing on the price of trailed cultivator drills, 1984 data

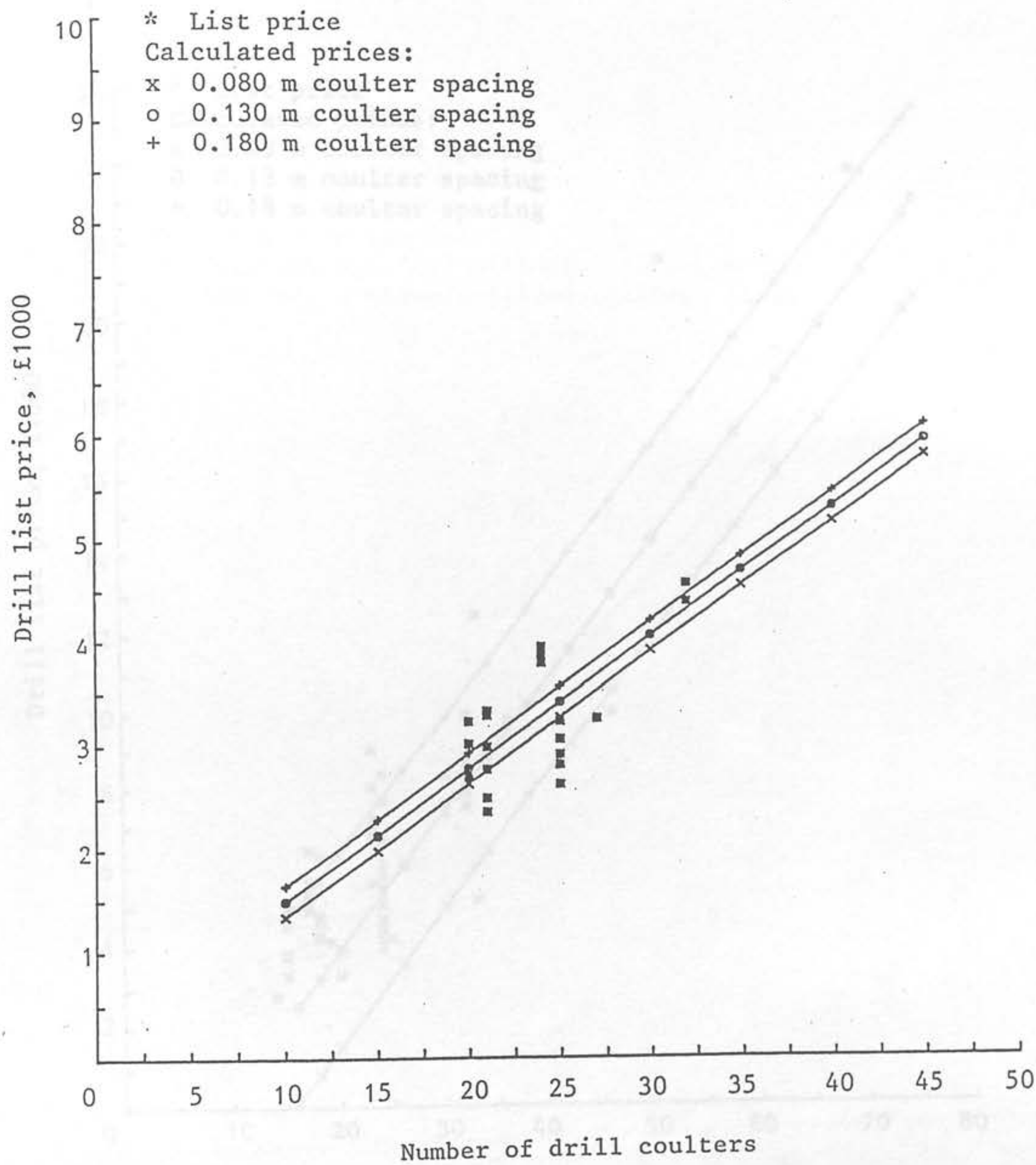


Fig 6.13 The effect of number of coulters and coulter spacing on the price of mounted combine drills (including cultivator and direct drill), 1984 data

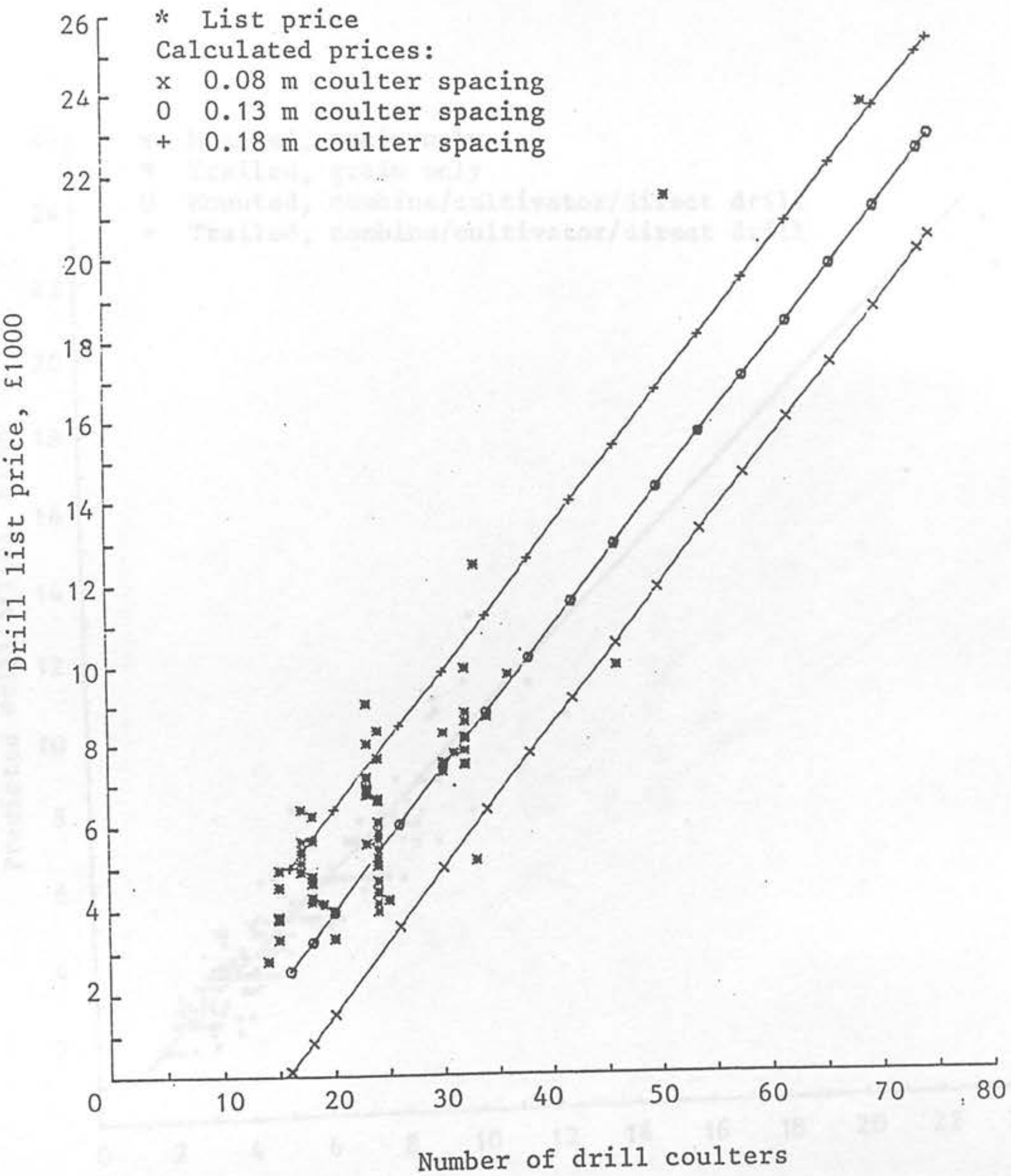


Fig 6.14 The effect of number of coulters and coulter spacing on the price of trailed combine drills (including cultivator and direct drill), 1984 data

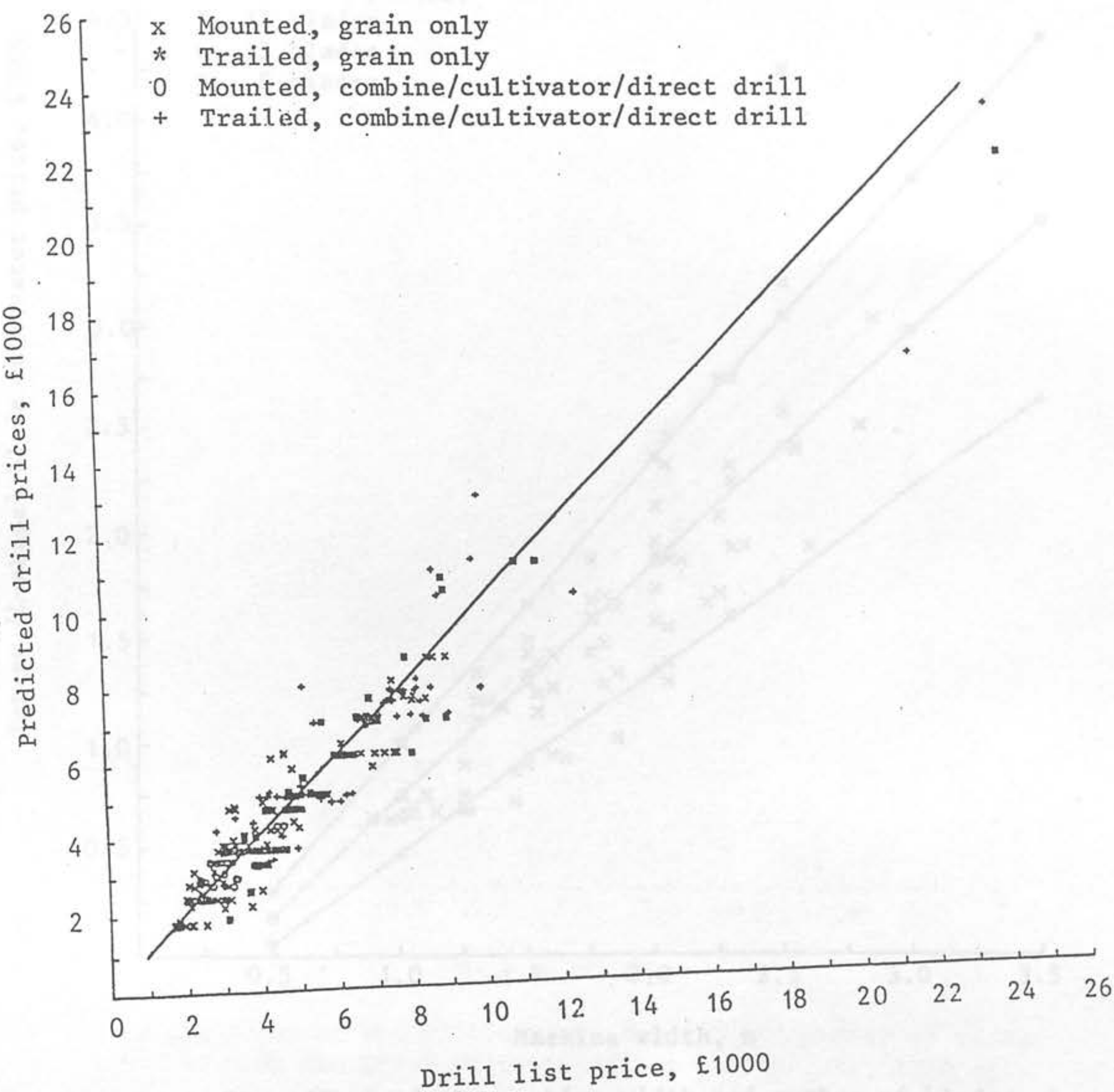


Fig 6.15 Predicted against list price of various types of grain drills, 1984 data

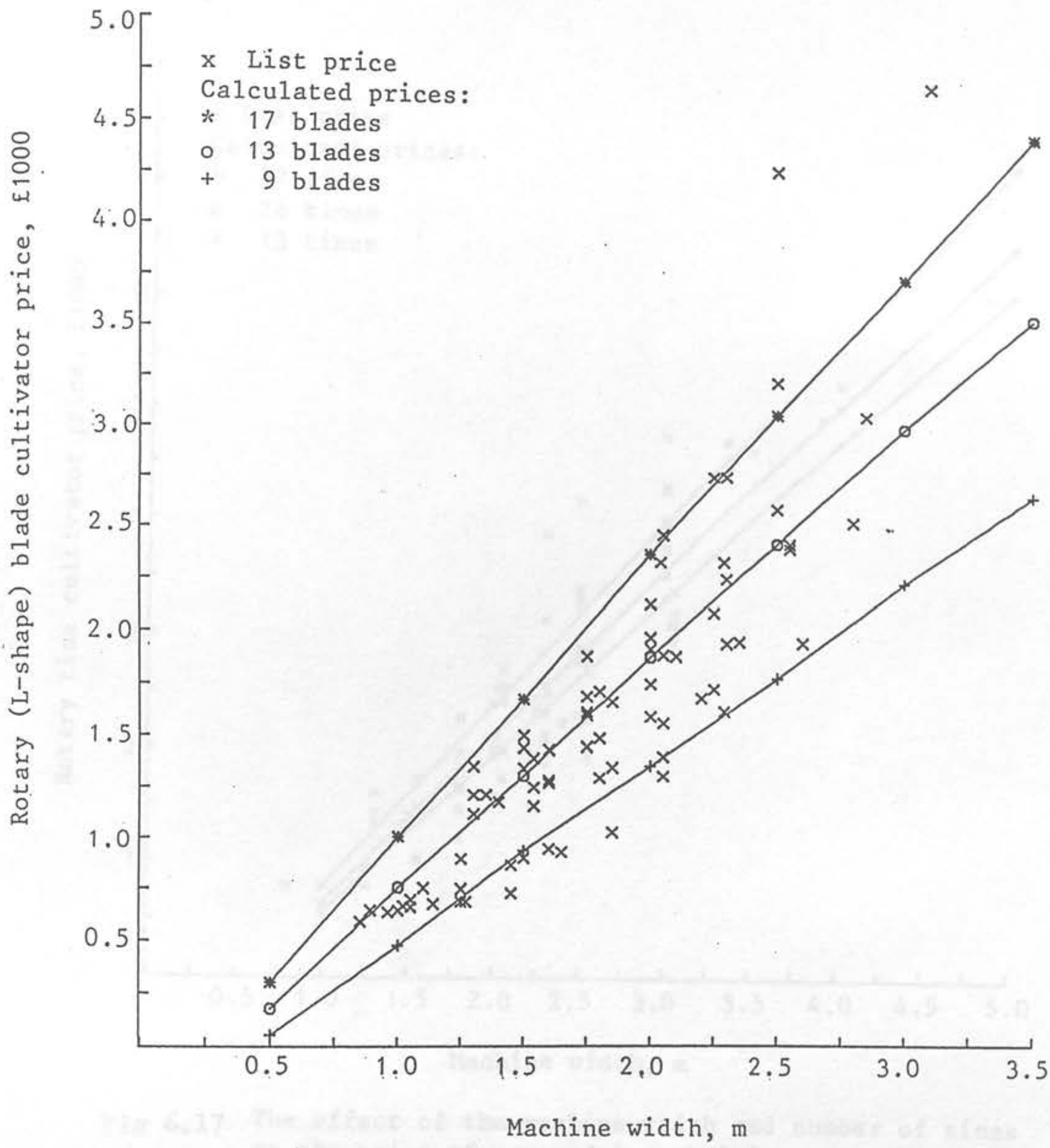


Fig 6.16 The effect of the machine width and number of blades (L-shape) on the price of power driven rotary cultivators, 1984 data

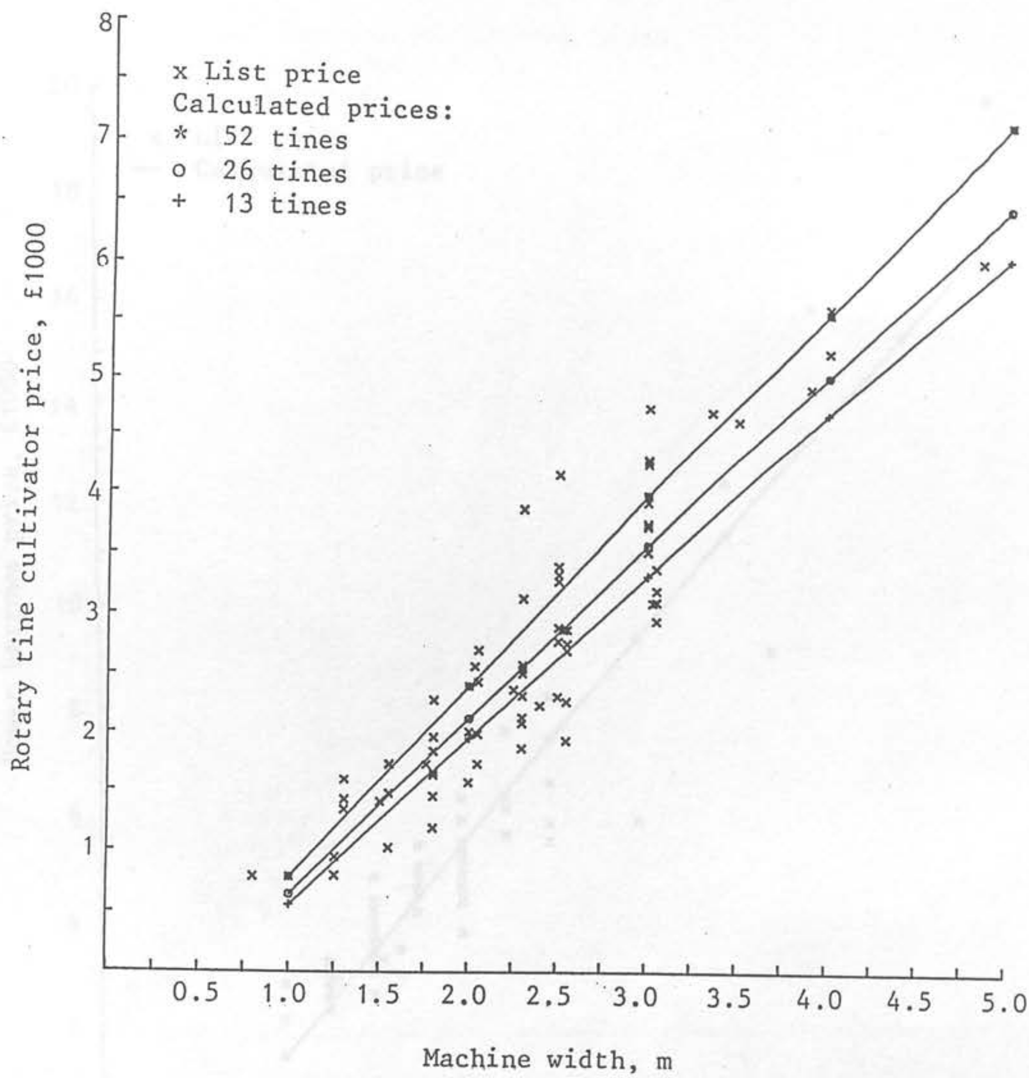


Fig 6.17 The effect of the machine width and number of tines on the price of power-driven cultivators, 1984 data

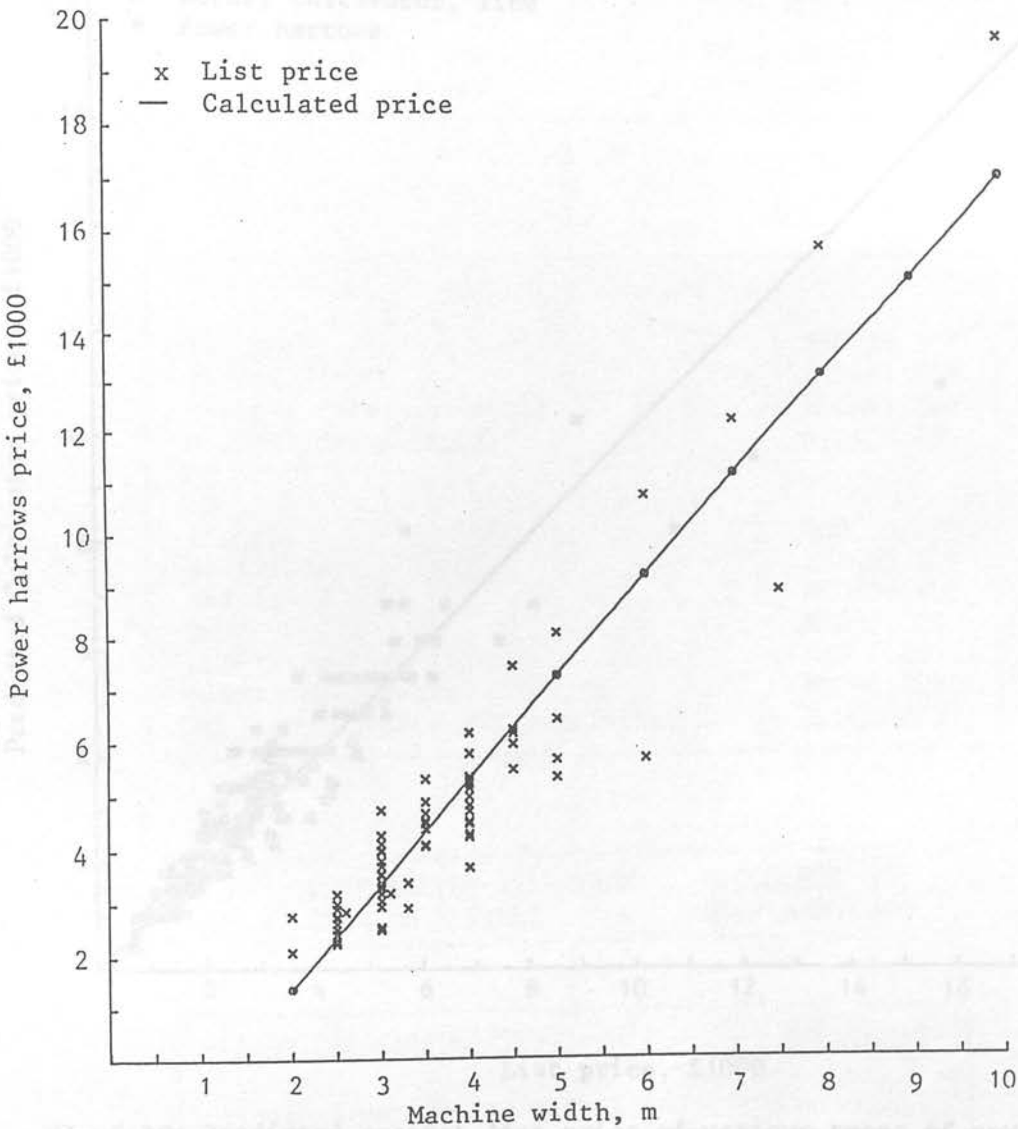


Fig 6.18 The effect of the machine width on the price of power harrows, 1984 data

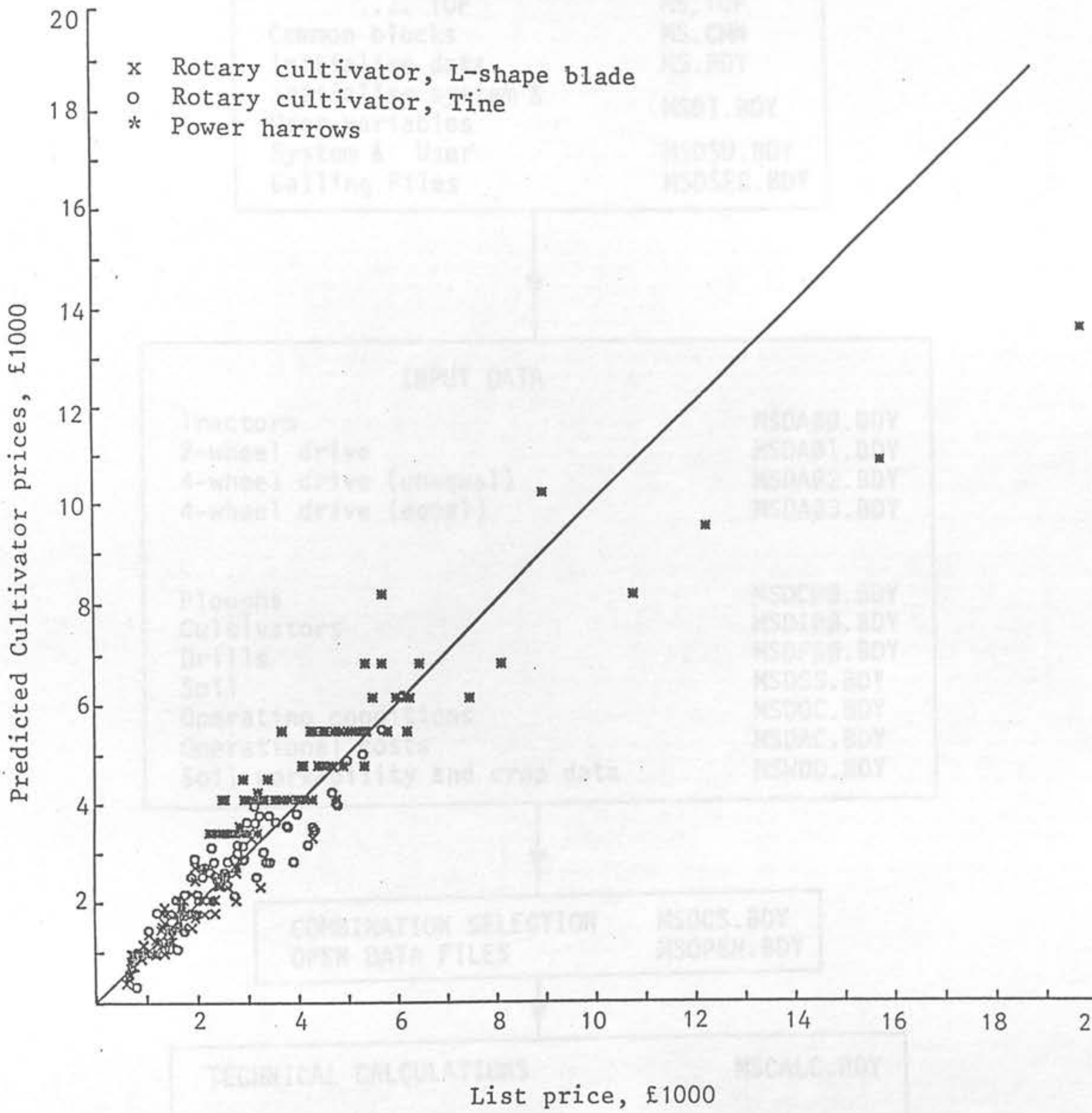
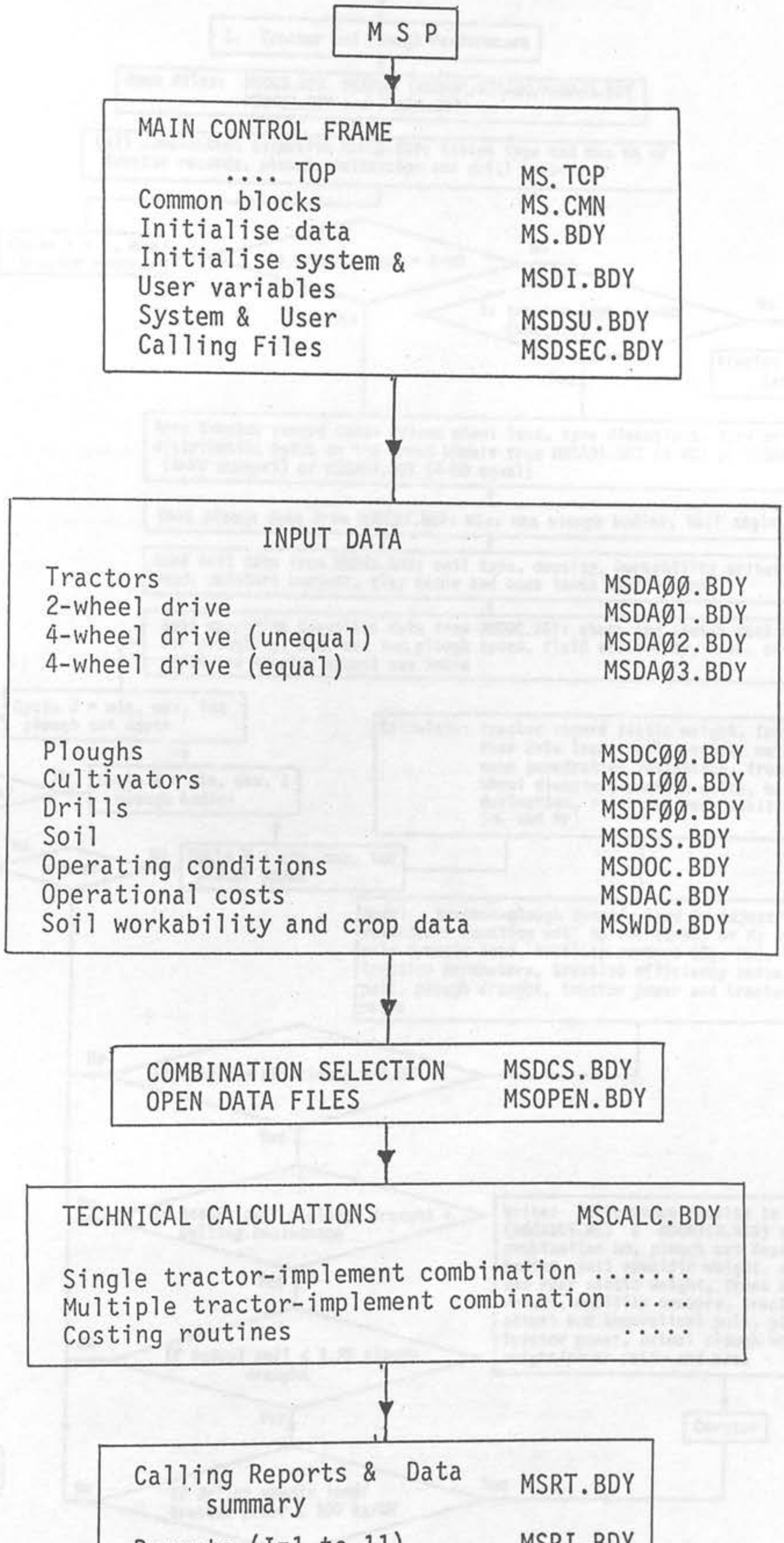


Fig 6.19 Predicted against list price of various types of power driven cultivators, 1984 data

Fig 7.1 Machinery selection programme "MSP" simplified diagram



TOP is used with all the sub-routines

Fig 7.2 Flow chart of the Machinery Selection Programme, "MSP".

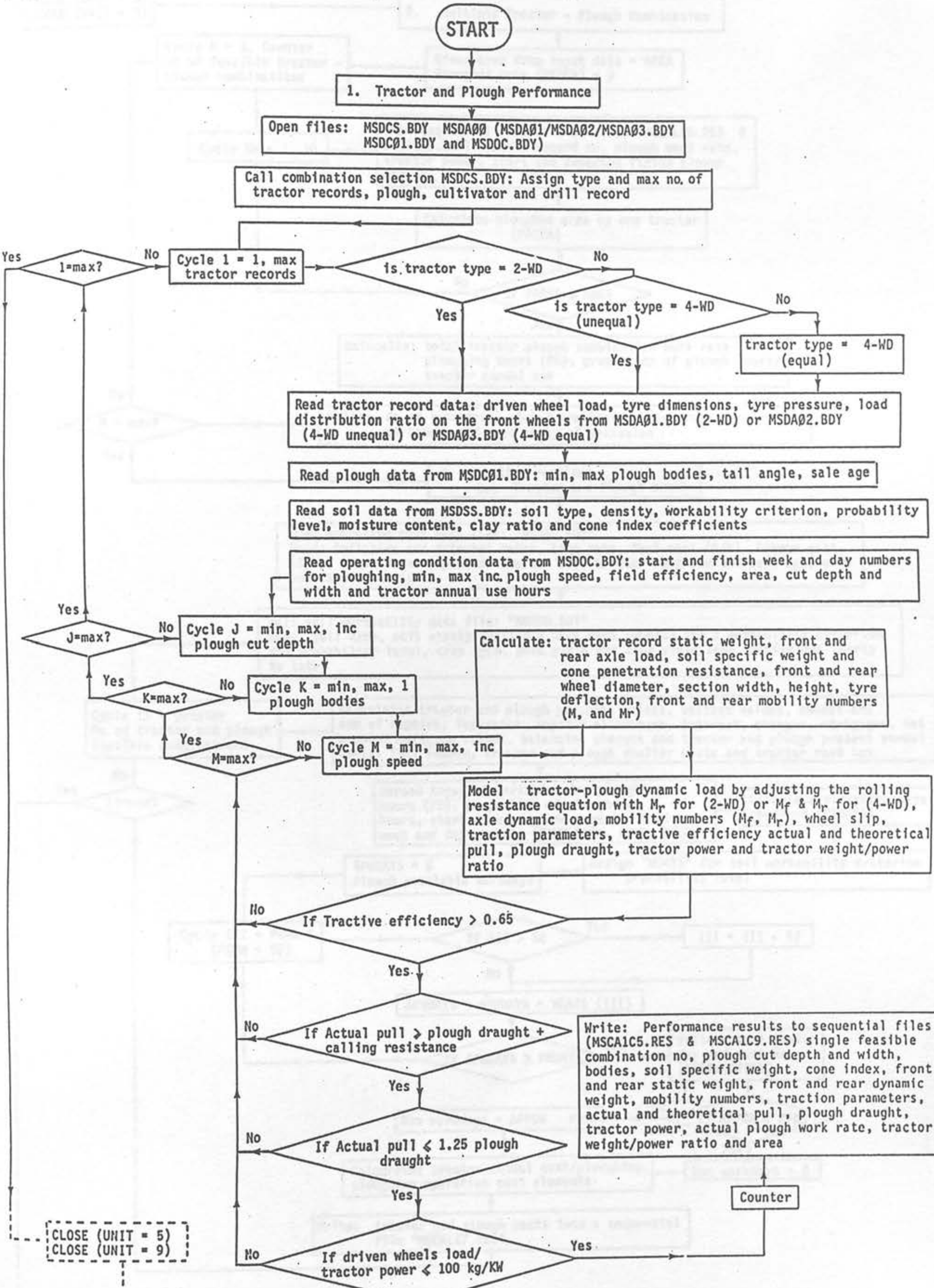


Fig. 7.2 cont'd.

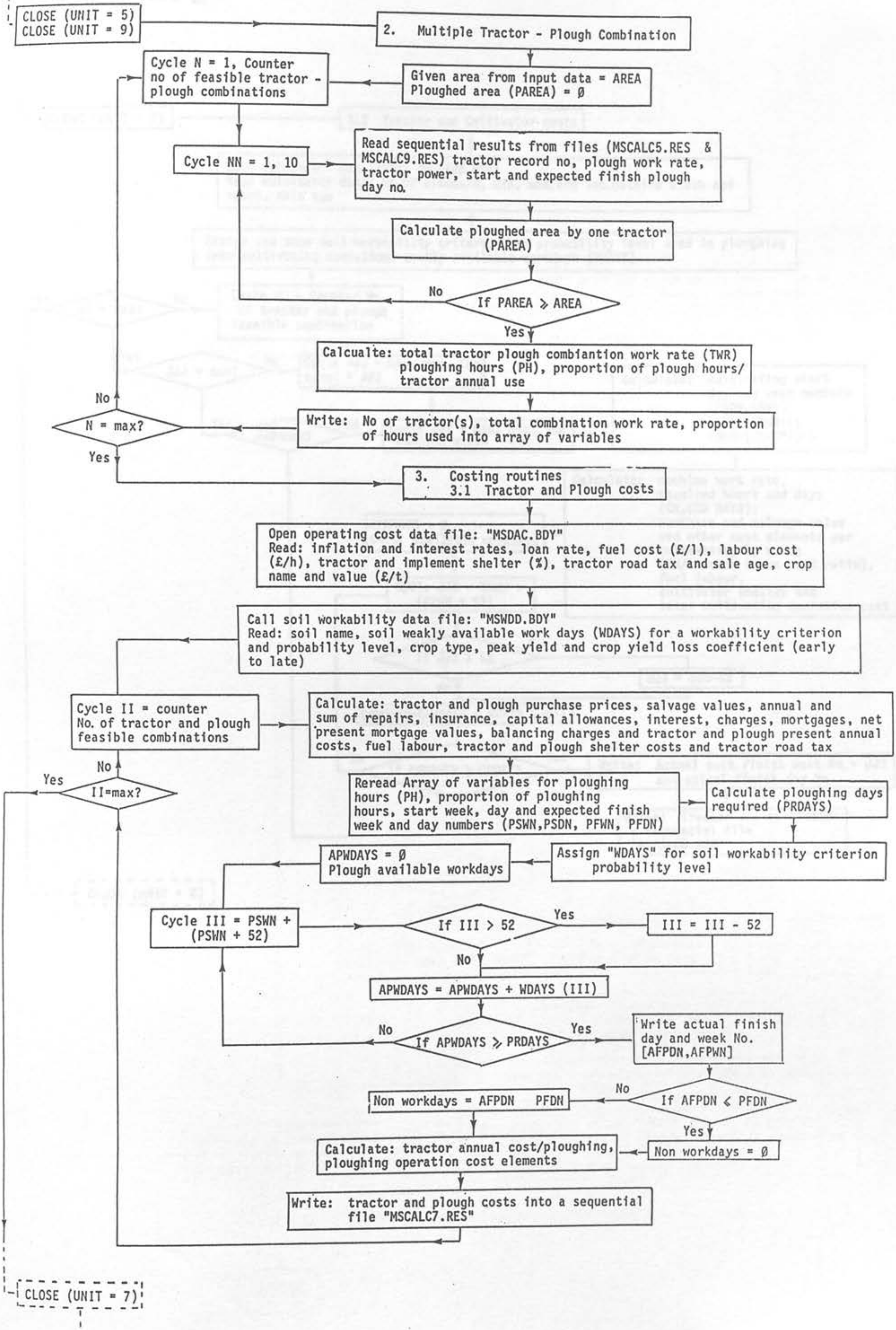

CLOSE (UNIT = 5)
CLOSE (UNIT = 9)
2. Multiple Tractor - Plough Combination
Cycle N = 1, Counter no of feasible tractor - plough combinations
Given area from input data = AREA
Ploughed area (PAREA) = Ø
Cycle NN = 1, 10
Read sequential results from files (MSCALC5.RES & MSCALC9.RES) tractor record no, plough work rate, tractor power, start and expected finish plough day no.
Calculate ploughed area by one tractor (PAREA)
No
If PAREA ≥ AREA
Yes
Calcualte: total tractor plough combiantion work rate (TWR) ploughing hours (PH), proportion of plough hours/ tractor annual use
No
N = max?
Yes
Write: No of tractor(s), total combination work rate, proportion of hours used into array of variables
3. Costing routines
3.1 Tractor and Plough costs
Open operating cost data file: "MSDAC.BDY"
Read: inflation and interest rates, loan rate, fuel cost (£/l), labour cost (£/h), tractor and implement shelter (%), tractor road tax and sale age, crop name and value (£/t)
Call soil workability data file: "MSWDD.BDY"
Read: soil name, soil weakly available work days (WDAYS) for a workability criterion and probability level, crop type, peak yield and crop yield loss coefficient (early to late)
Cycle II = counter No. of tractor and plough feasible combinations
Calculate: tractor and plough purchase prices, salvage values, annual and sum of repairs, insurance, capital allowances, interest, charges, mortgages, net present mortgage values, balancing charges and tractor and plough present annual costs, fuel labour, tractor and plough shelter costs and tractor road tax
Yes
II=max?
Reread Array of variables for ploughing hours (PH), proportion of ploughing hours, start week, day and expected finish week and day numbers (PSWN,PSDN, PFWN, PFDN)
Calculate ploughing days required (PRDAYS)
APWDAYS = Ø
Plough available workdays
Assign "WDAYS" for soil workability criterion probability level
Cycle III = PSWN + (PSWN + 52)
If III > 52
Yes
III = III - 52
No
APWDAYS = APWDAYS + WDAYS (III)
No
If APWDAYS ≥ PRDAYS
Yes
Write actual finish day and week No. [AFPDN,AFPWN]
No
If AFPDN < PFDN
Yes
Non workdays = AFPDN PFDN
Non workdays = Ø
Calculate: tractor annual cost/ploughing, ploughing operation cost elements
Write: tractor and plough costs into a sequential file "MSCALC7.RES"
CLOSE (UNIT = 7)

Fig. 7.2 cont'd.

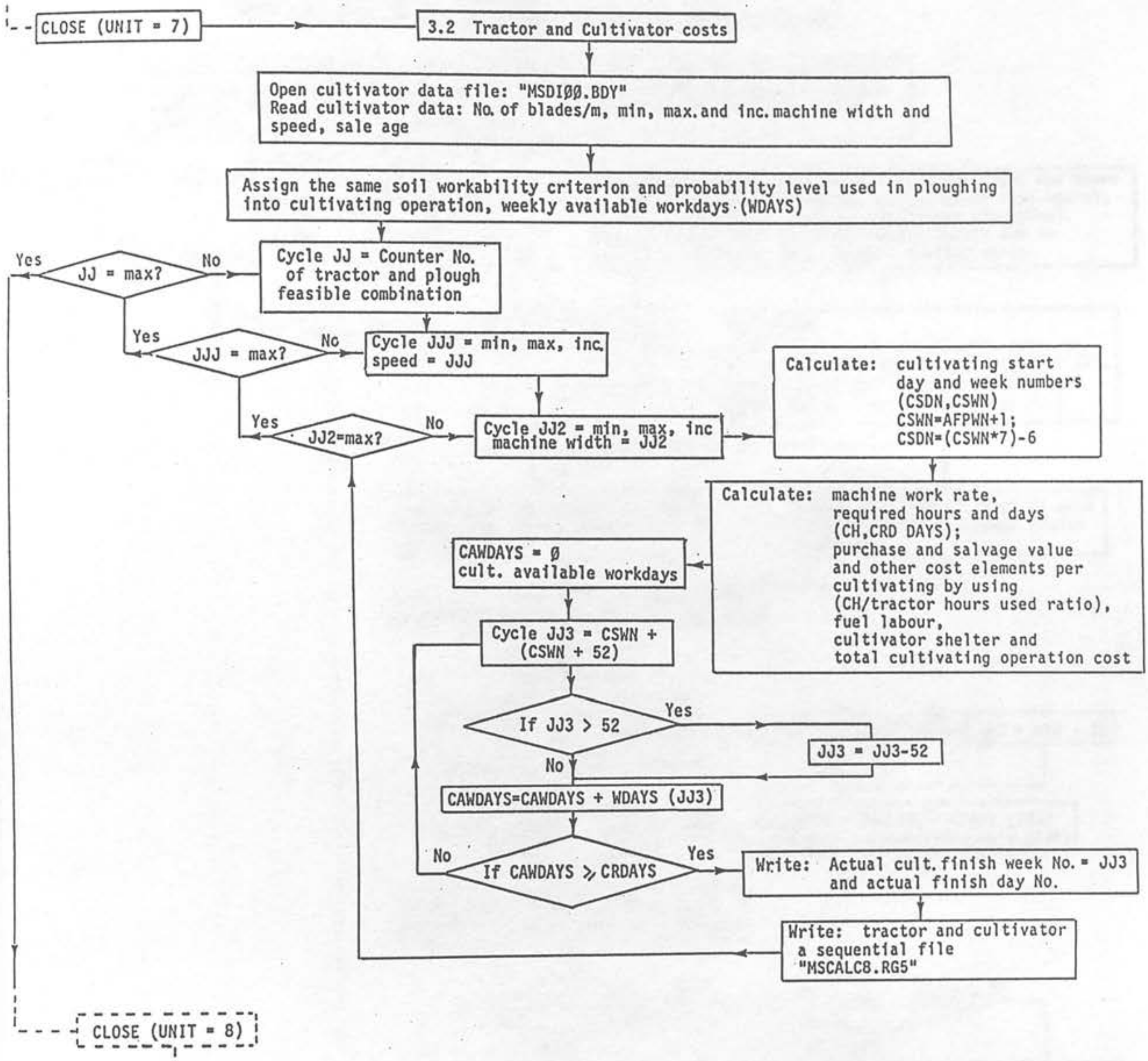
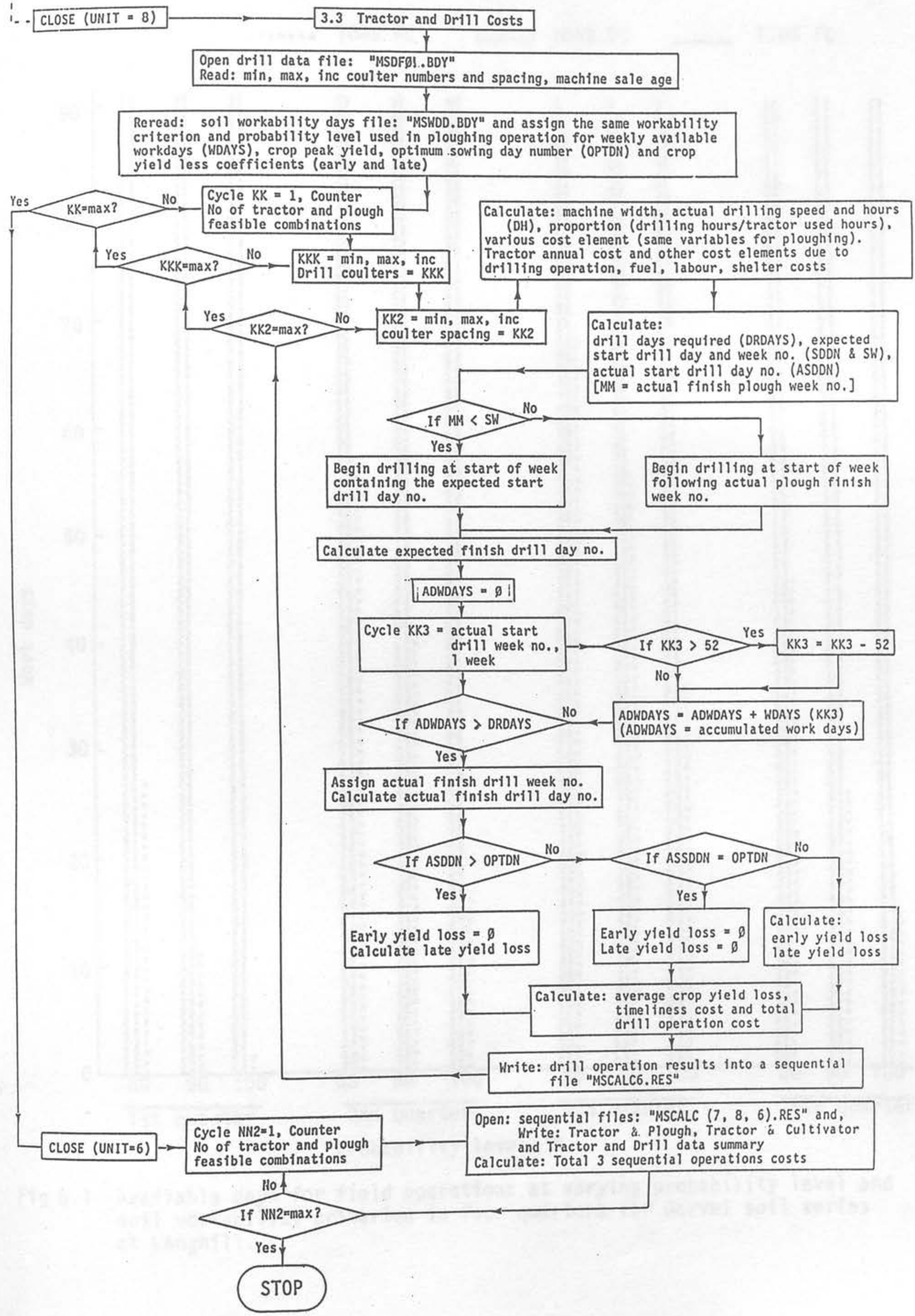

CLOSE (UNIT = 7)
3.2 Tractor and Cultivator costs
Open cultivator data file: "MSDIØØ.BDY"
Read cultivator data: No. of blades/m, min, max. and inc. machine width and speed, sale age
Assign the same soil workability criterion and probability level used in ploughing into cultivating operation, weekly available workdays (WDAYS)
Yes
JJ = max?
No
Cycle JJ = Counter No. of tractor and plough feasible combination
Yes
JJJ = max?
No
Cycle JJJ = min, max, inc speed = JJJ
Yes
JJ2=max?
No
Cycle JJ2 = min, max, inc machine width = JJ2
Calculate: cultivating start day and week numbers (CSDN,CSWN)
CSWN=AFPWN+1;
CSDN=(CSWN*7)-6
Calculate: machine work rate, required hours and days (CH,CRD DAYS); purchase and salvage value and other cost elements per cultivating by using (CH/tractor hours used ratio), fuel labour, cultivator shelter and total cultivating operation cost
CAWDAYS = Ø
cult. available workdays
Cycle JJ3 = CSWN + (CSWN + 52)
If JJ3 > 52
Yes
JJ3 = JJ3-52
No
CAWDAYS=CAWDAYS + WDAYS (JJ3)
No
If CAWDAYS ≥ CRDAYS
Yes
Write: Actual cult. finish week No. = JJ3 and actual finish day No.
Write: tractor and cultivator a sequential file "MSCALC8.RG5"
CLOSE (UNIT = 8)

Fig. 7.2 cont'd.


CLOSE (UNIT = 8)
3.3 Tractor and Drill Costs
Open drill data file: "MSDFØ1.BDY"
Read: min, max, inc coulter numbers and spacing, machine sale age
Reread: soil workability days file: "MSWDD.BDY" and assign the same workability criterion and probability level used in ploughing operation for weekly available workdays (WDAYS), crop peak yield, optimum sowing day number (OPTDN) and crop yield less coefficients (early and late)
Cycle KK = 1, Counter No of tractor and plough feasible combinations
KK=max?
Yes
No
KKK=max?
KKK = min, max, inc Drill coulters = KKK
KK2=max?
KK2 = min, max, inc coulter spacing = KK2
Calculate: machine width, actual drilling speed and hours (DH), proportion (drilling hours/tractor used hours), various cost element (same variables for ploughing). Tractor annual cost and other cost elements due to drilling operation, fuel, labour, shelter costs
Calculate: drill days required (DRDAYS), expected start drill day and week no. (SDDN & SW), actual start drill day no. (ASDDN) [MM = actual finish plough week no.]
If MM < SW
Begin drilling at start of week containing the expected start drill day no.
Begin drilling at start of week following actual plough finish week no.
Calculate expected finish drill day no.
ADWDAYS = Ø
Cycle KK3 = actual start drill week no., 1 week
If KK3 > 52
KK3 = KK3 - 52
ADWDAYS = ADWDAYS + WDAYS (KK3) (ADWDAYS = accumulated work days)
If ADWDAYS > DRDAYS
Assign actual finish drill week no. Calculate actual finish drill day no.
If ASDDN > OPTDN
If ASSDDN = OPTDN
Early yield loss = Ø Calculate late yield loss
Early yield loss = Ø Late yield loss = Ø
Calculate: early yield loss late yield loss
Calculate: average crop yield loss, timeliness cost and total drill operation cost
Write: drill operation results into a sequential file "MSCALC6.RES"
CLOSE (UNIT=6)
Cycle NN2=1, Counter No of tractor and plough feasible combinations
Open: sequential files: "MSCALC (7, 8, 6).RES" and, Write: Tractor & Plough, Tractor & Cultivator and Tractor and Drill data summary
Calculate: Total 3 sequential operations costs
If NN2=max?
STOP

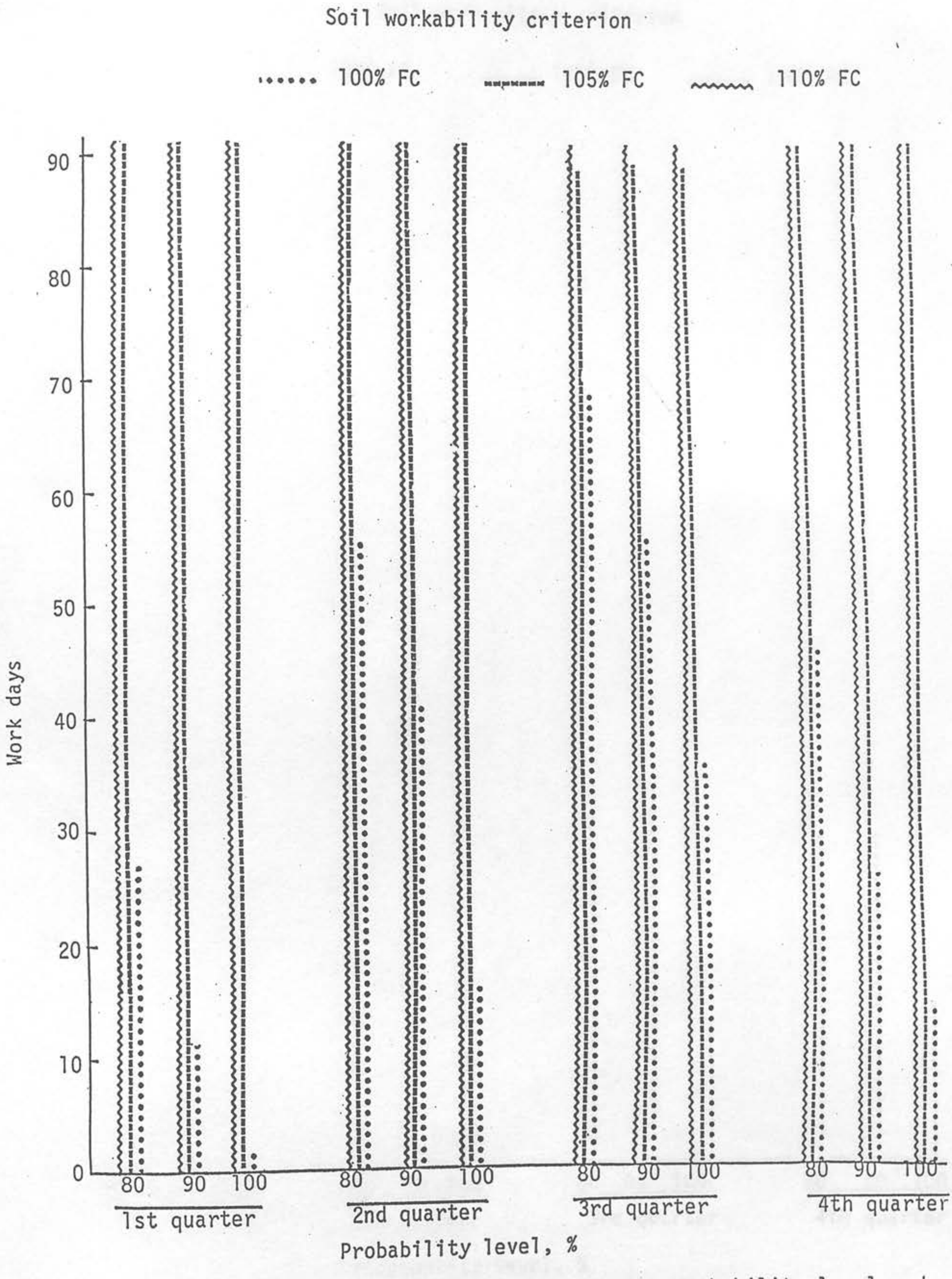


Fig 8.1 Available days for field operations at varying probability level and soil workability criterion in four quarters for Darvel soil series at Langhill.

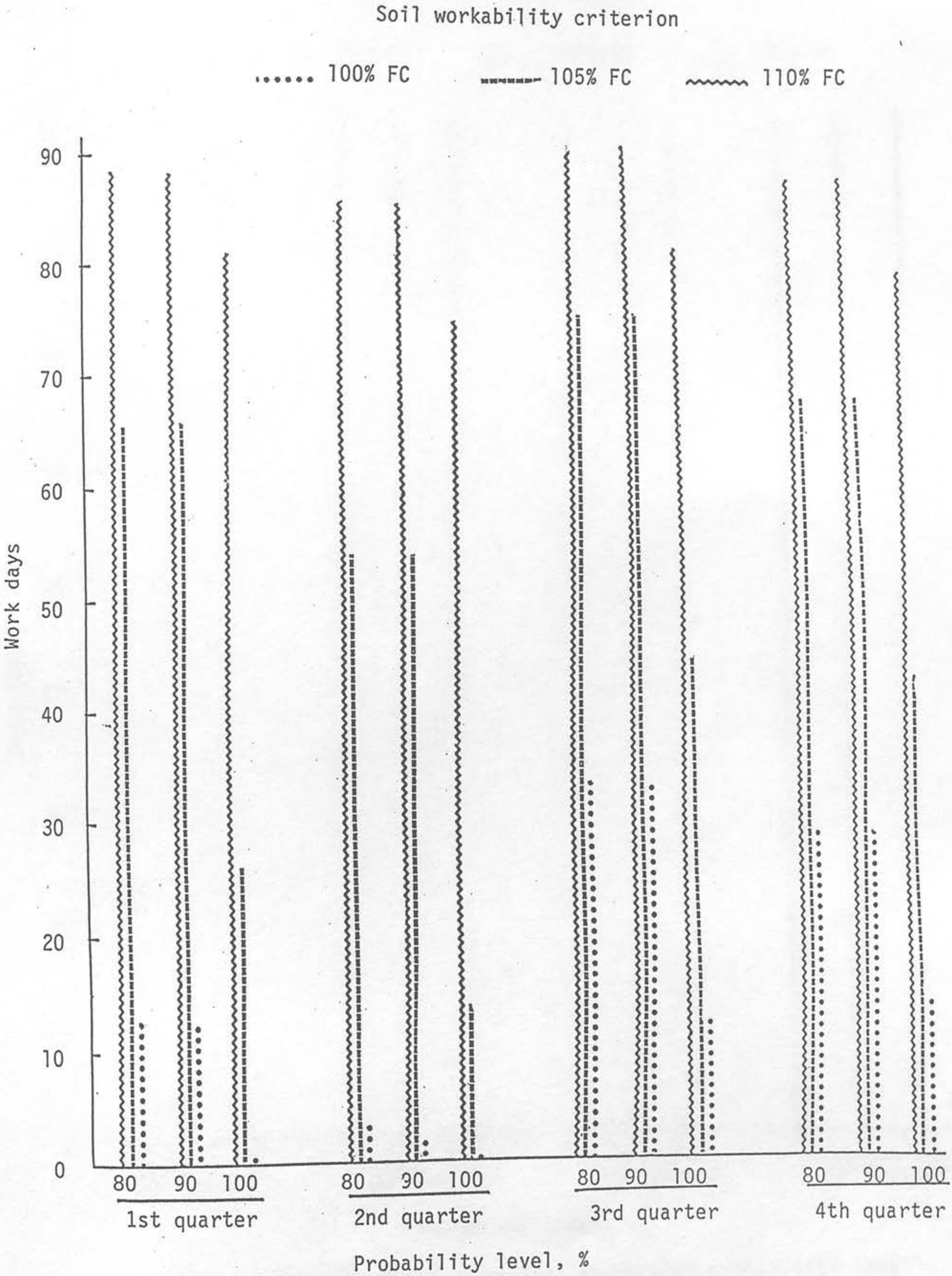


Fig 8.2 Available days for field operations at varying probability level and soil workability criterion in four quarters for Macmerry soil series at Langhill.

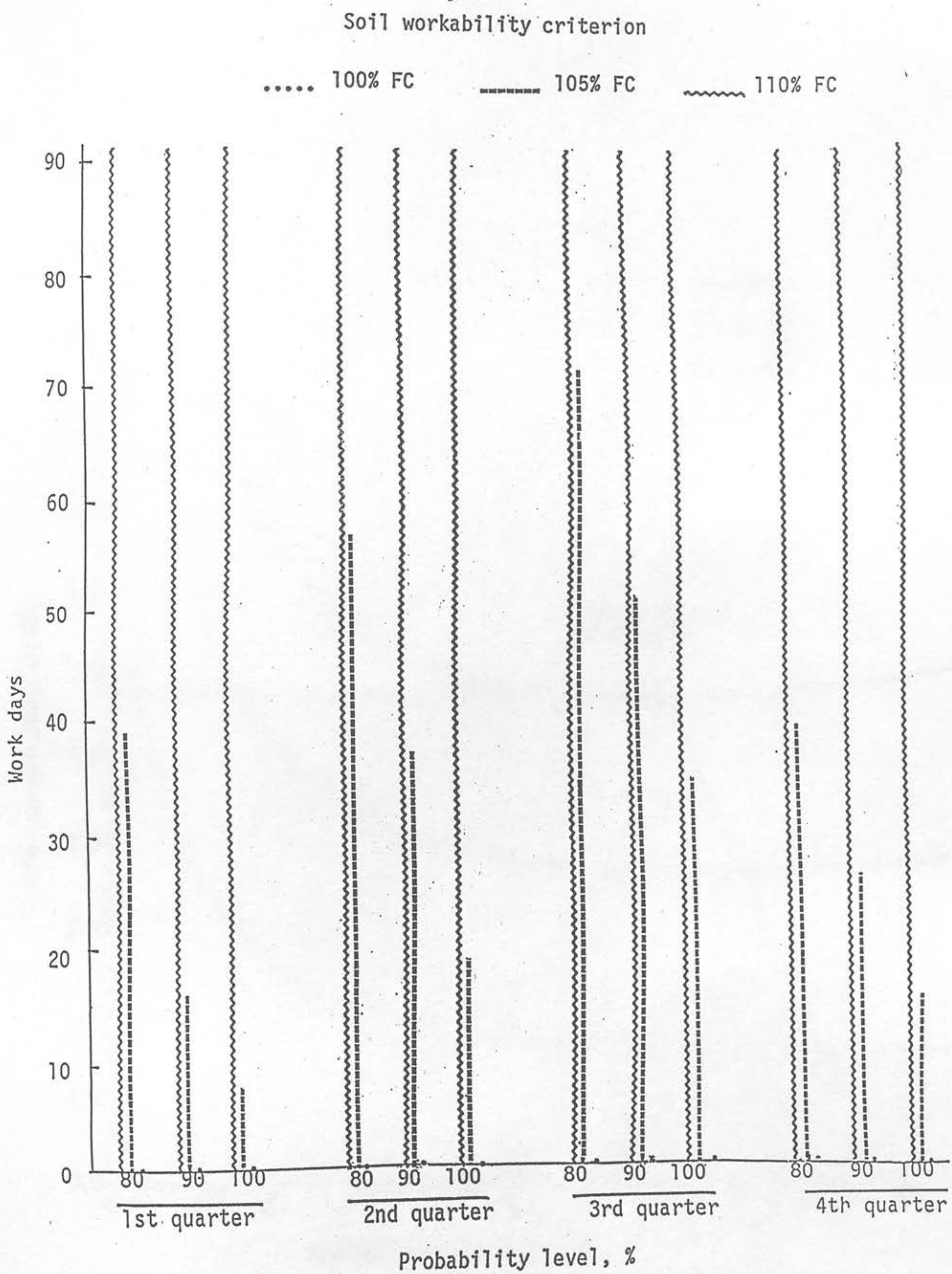


Fig 8.3 Available days for field operations at varying probability level and soil workability criterion in four quarters for Winton soil series at Langhill.

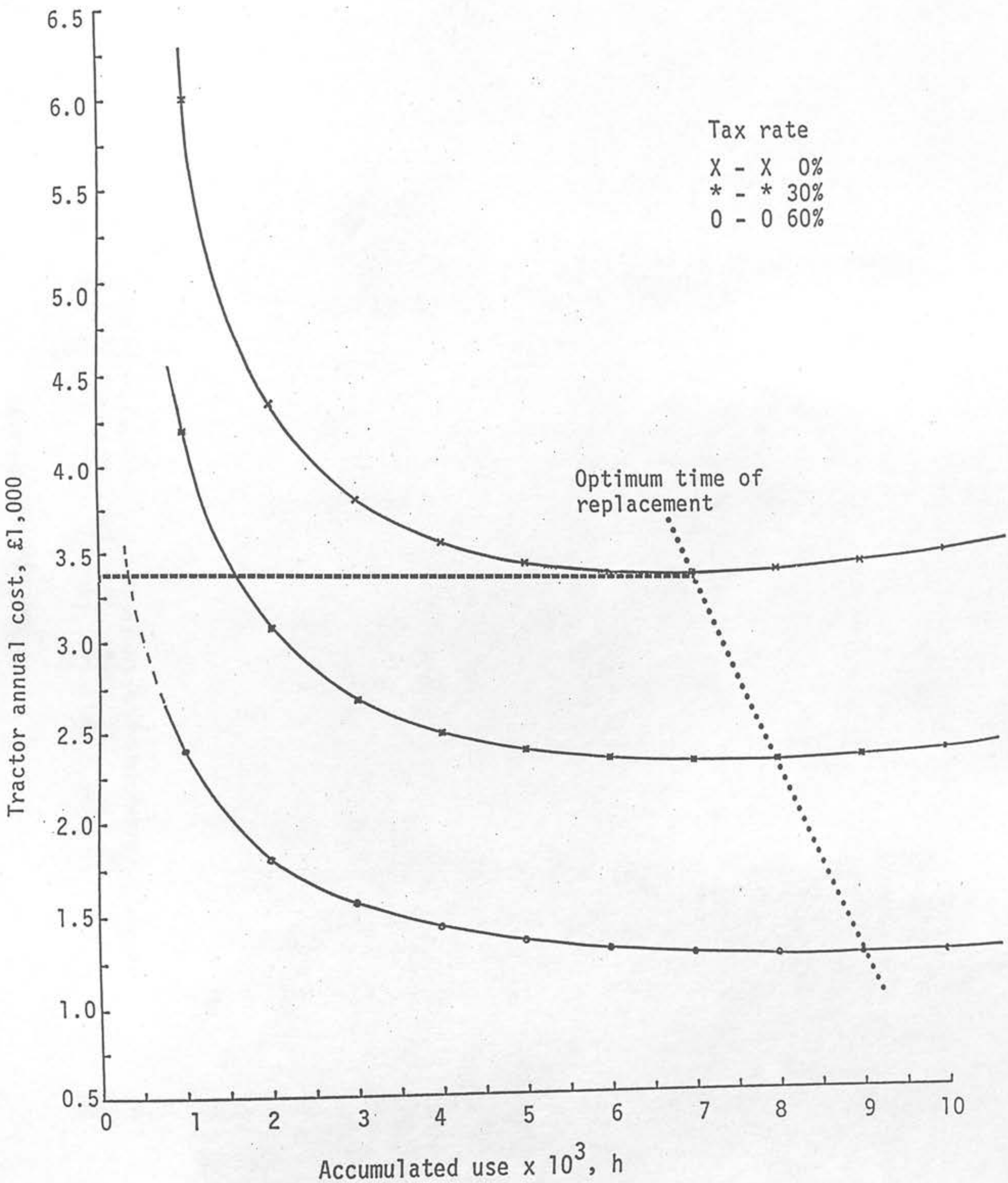


Fig 8.4 The effect of tax rate on tractor annual cost and optimum time of replacement for a 62 kW, 2-wheel drive tractor owned for 10 years

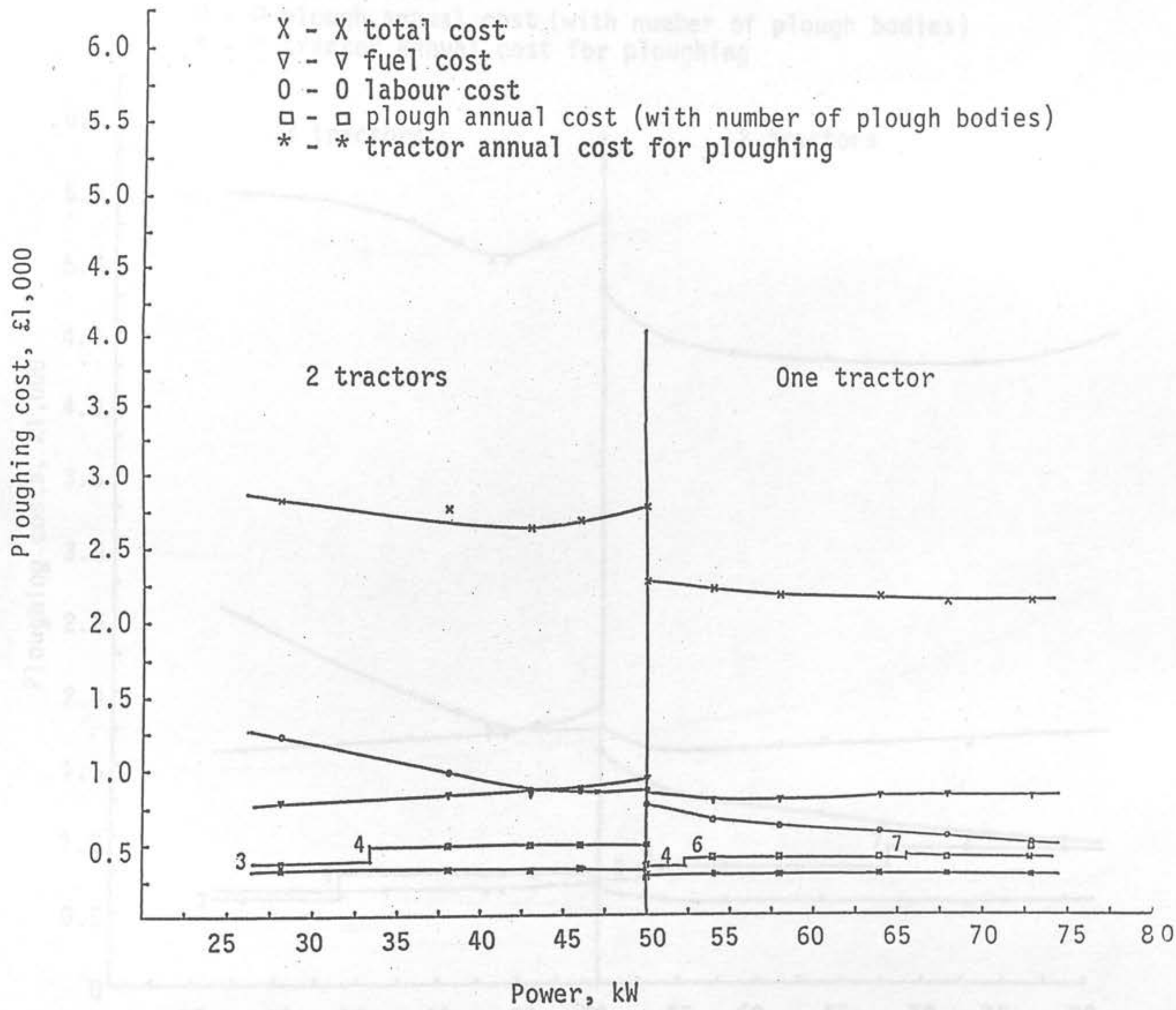


Fig 8.5 Variation of ploughing costs against power level using one or two 2-wheel drive tractor(s) for 100 ha over a 2 week period and for a soil workability criterion of 110% and probability level of 90%

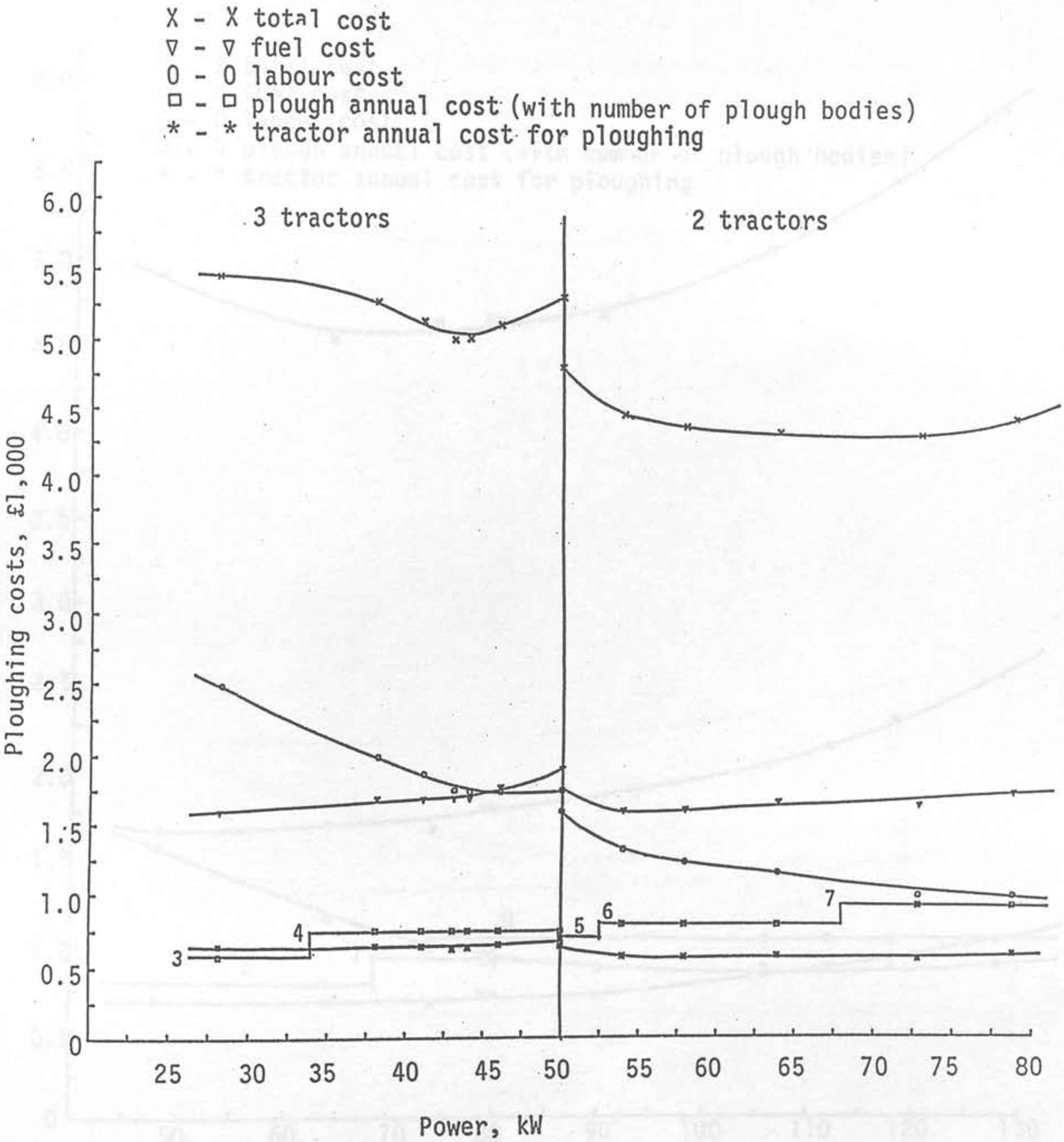


Fig 8.6 Variation of ploughing costs against power level using two or three 2-wheel drive tractors for 200 ha over a 3 week period and for a soil workability criterion of 110% and probability level of 90%

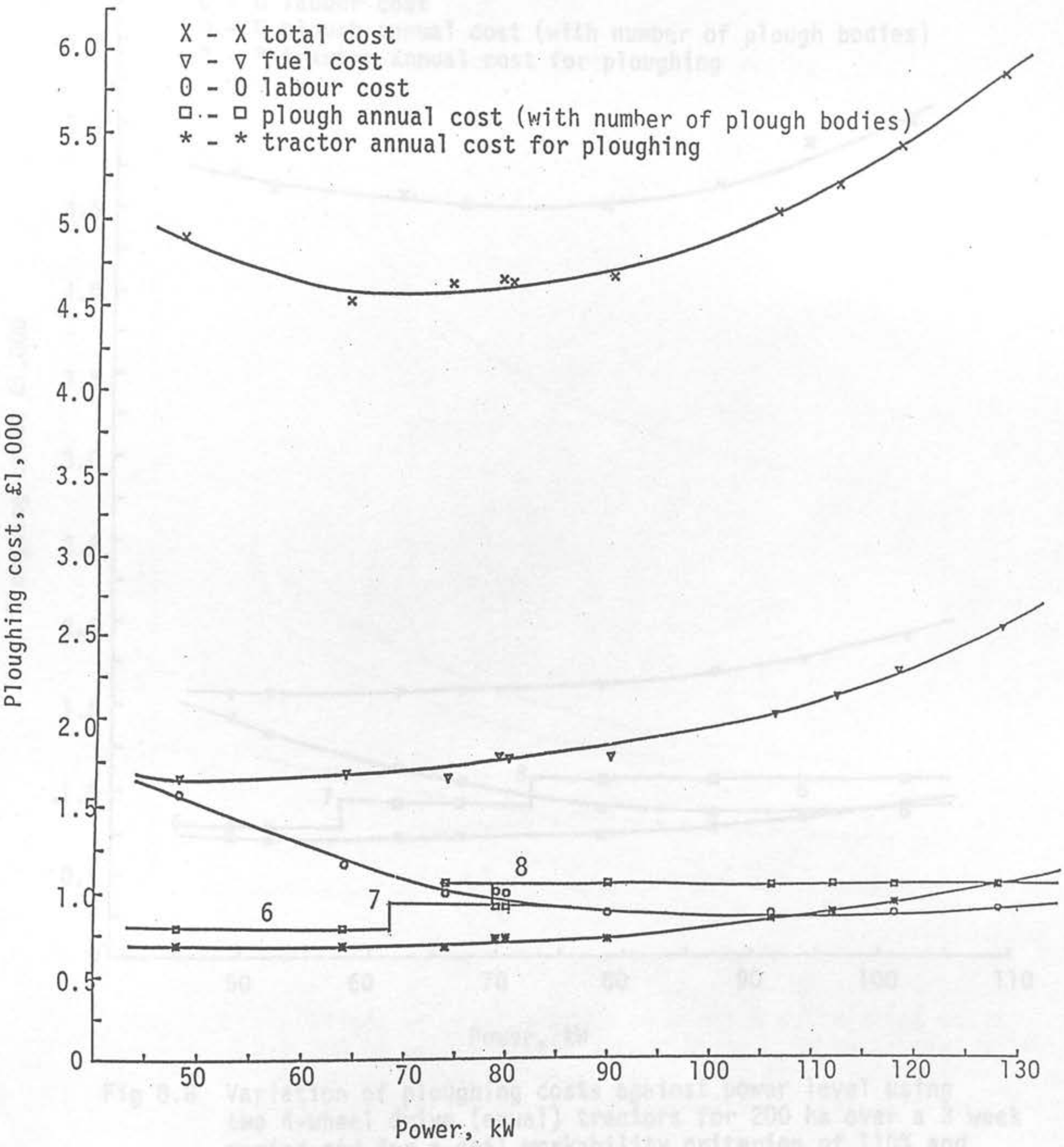


Fig 8.7 Variation of ploughing costs against power level using two 4-wheel drive (unequal) tractors for 200 ha over a 3 week period and for a soil workability of 110% and probability level of 90%

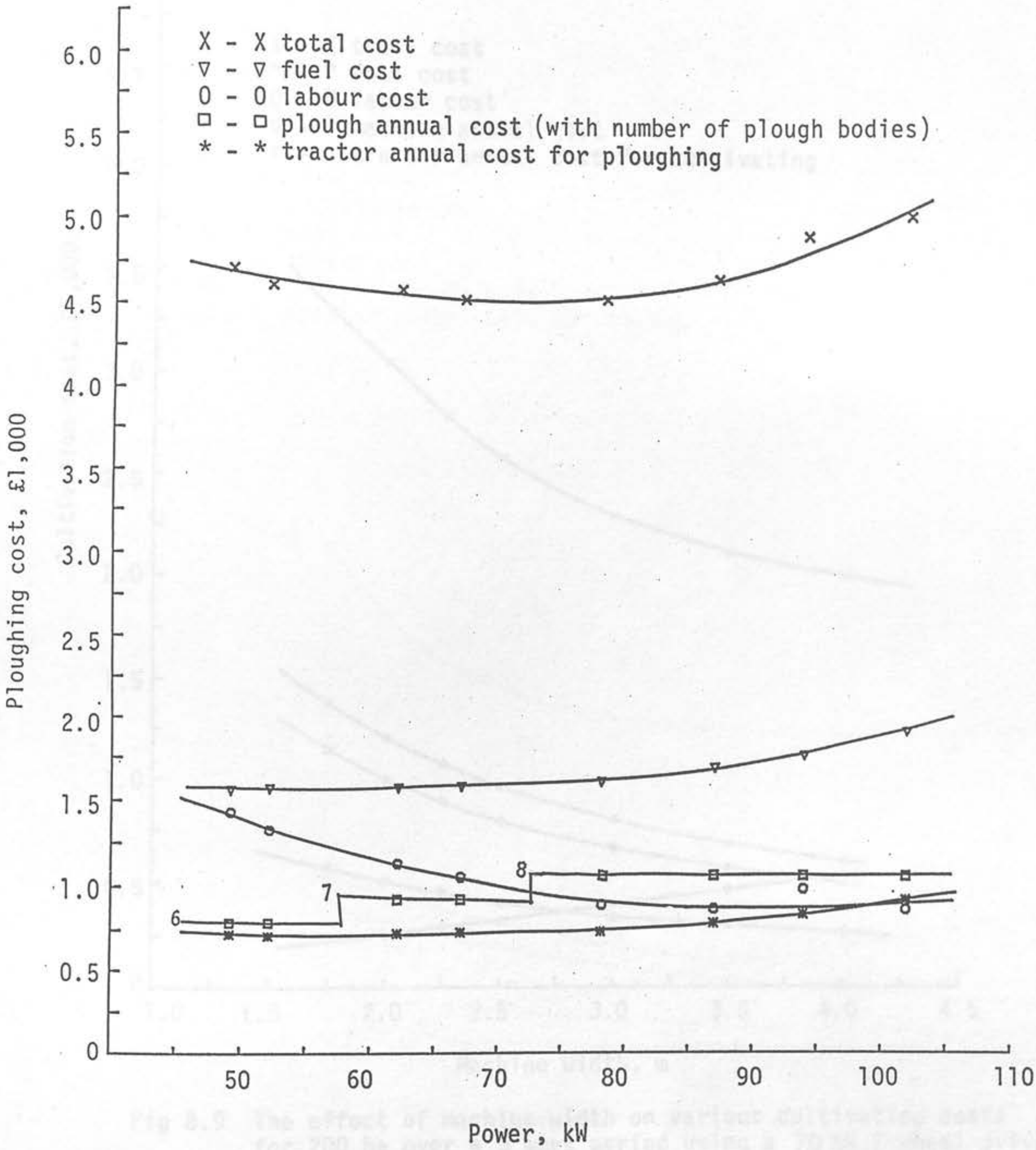


Fig 8.8 Variation of ploughing costs against power level using two 4-wheel drive (equal) tractors for 200 ha over a 3 week period and for a soil workability criterion of 110% and probability level of 90%

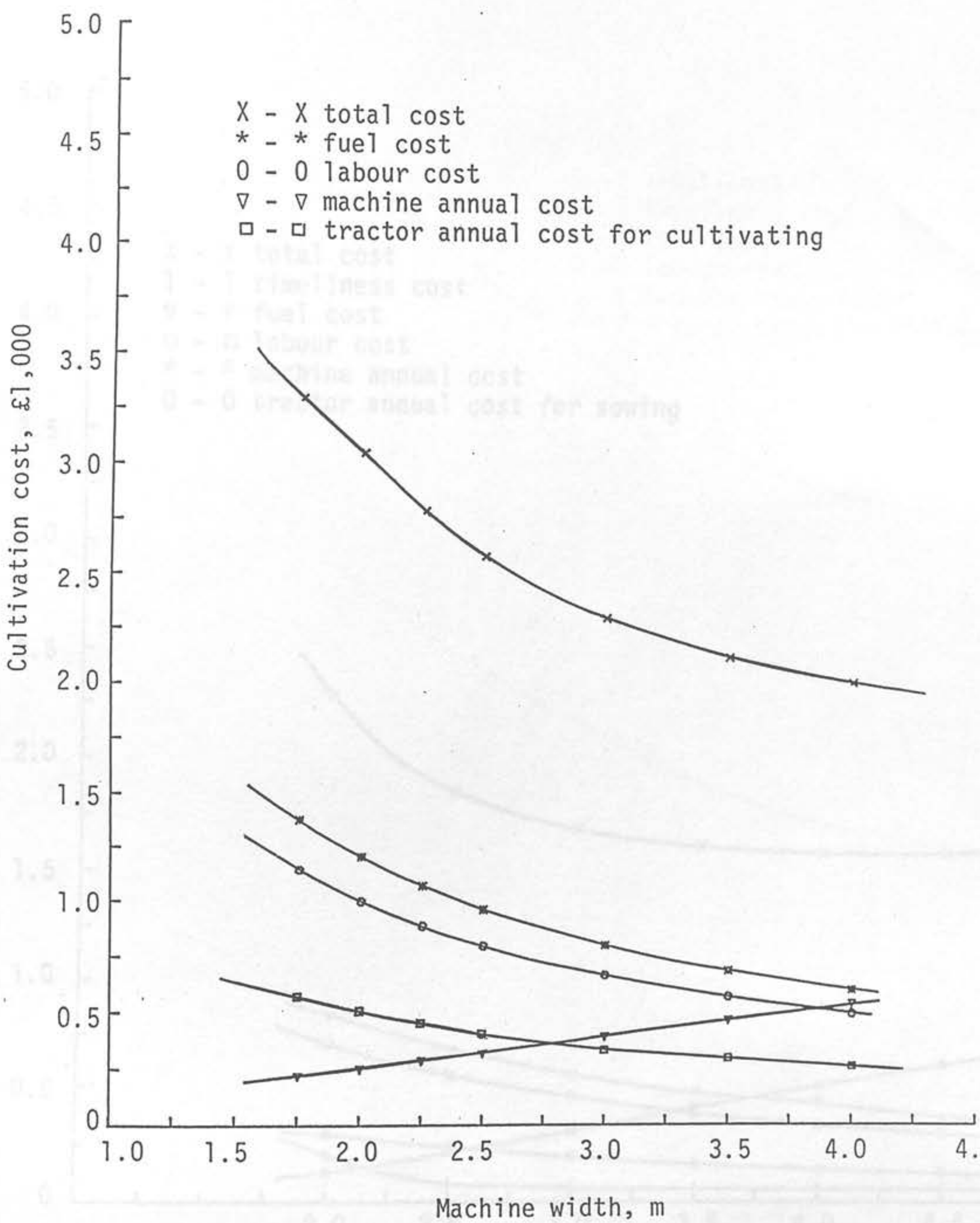


Fig 8.9 The effect of machine width on various cultivating costs for 200 ha over a 3 week period using a 70 kW 2-wheel drive tractor at forward speed of 6.24 km/h and for a soil workability criterion of 110% and probability level of 90%

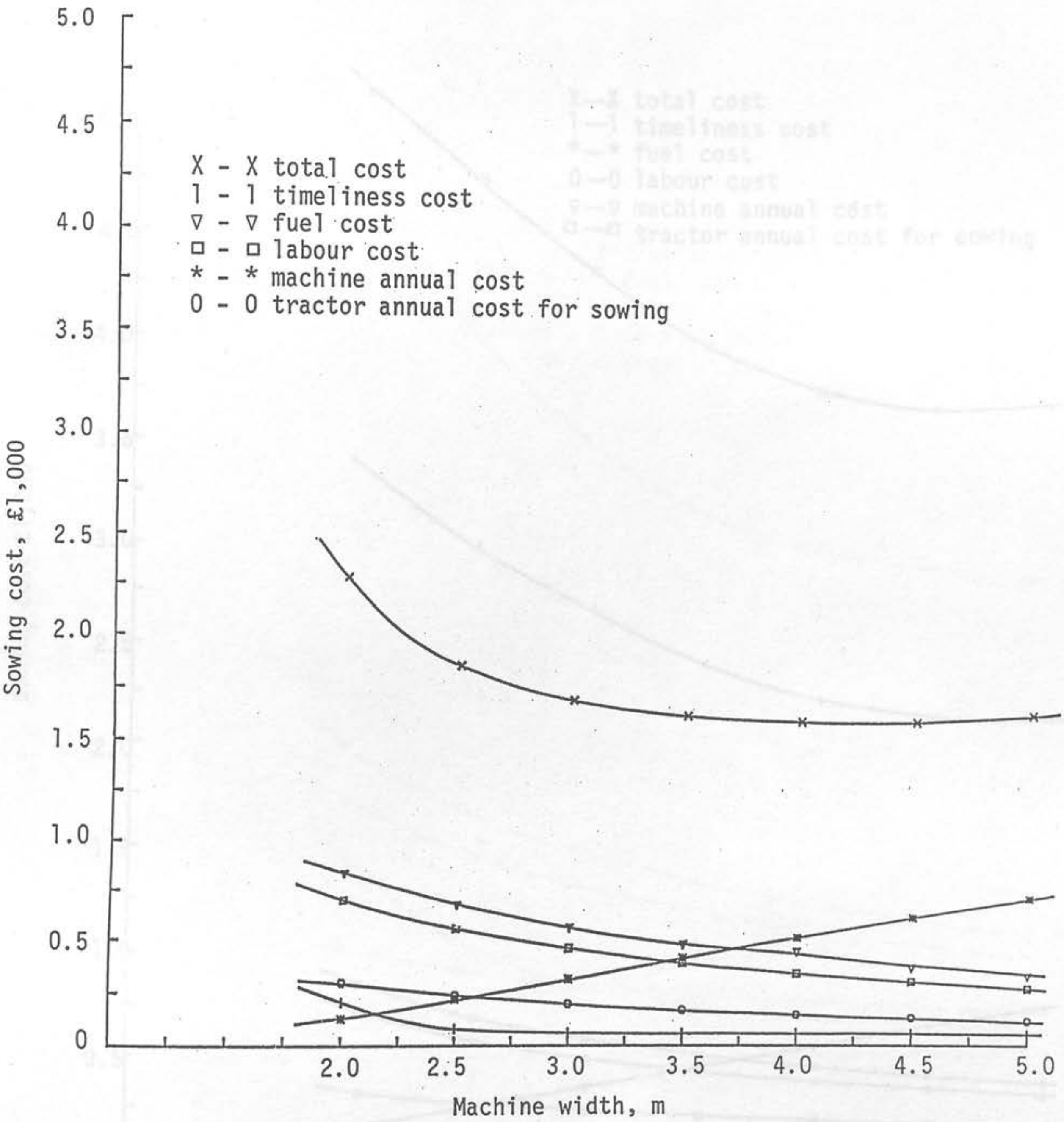


Fig 8.10 The effect of machine width on various sowing costs for 100 ha using a 55 kW 2-wheel drive tractor at forward speed of 4.46 km/h a soil workability criterion of 110% and probability level of 90%

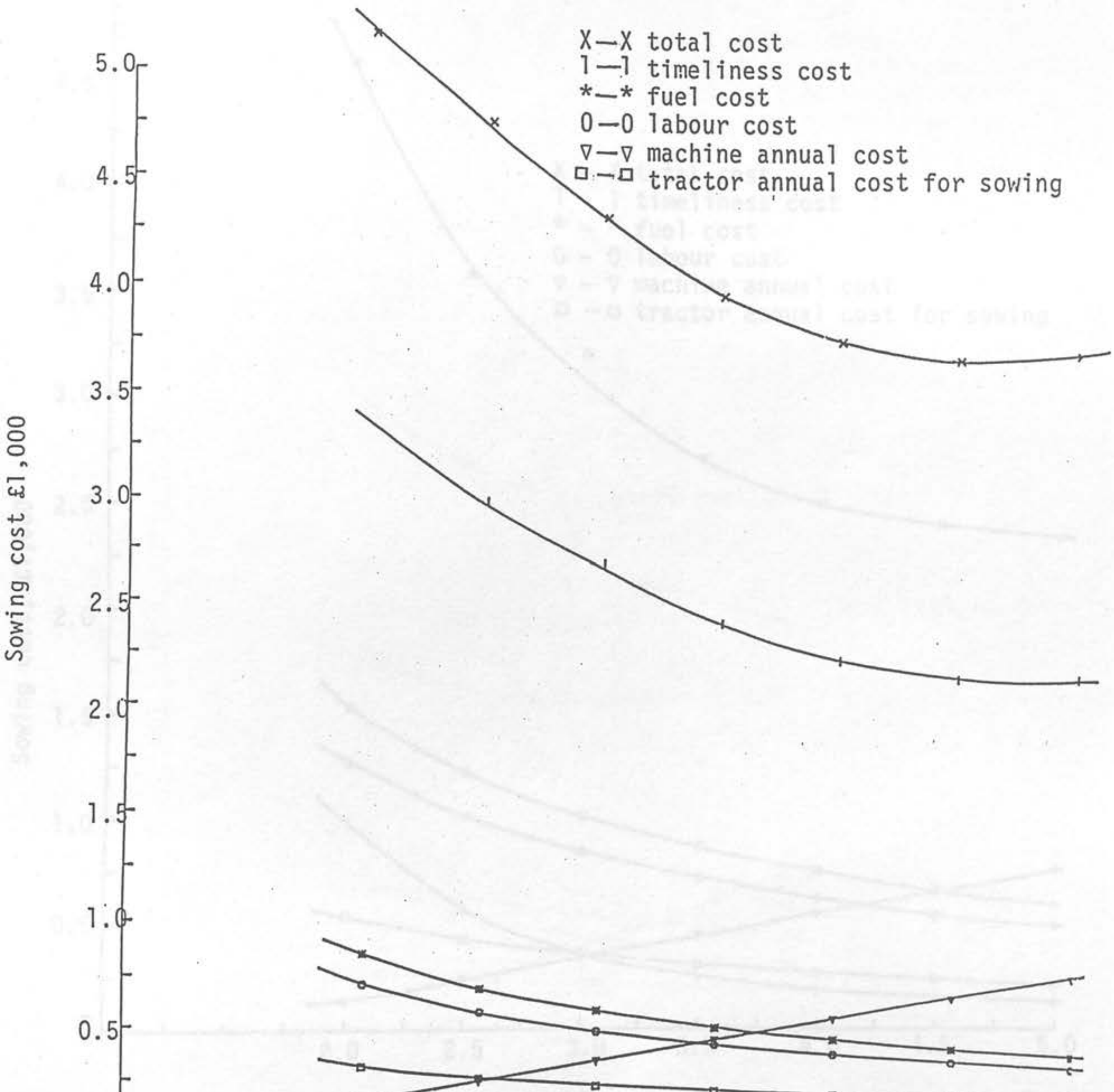


Fig 8.11 The effect of machine width on various sowing costs for 100 ha using a 55 kW 2-wheel drive tractor at forward speed of 4.46 km/h, a soil workability criterion of 105% and probability level of 90%

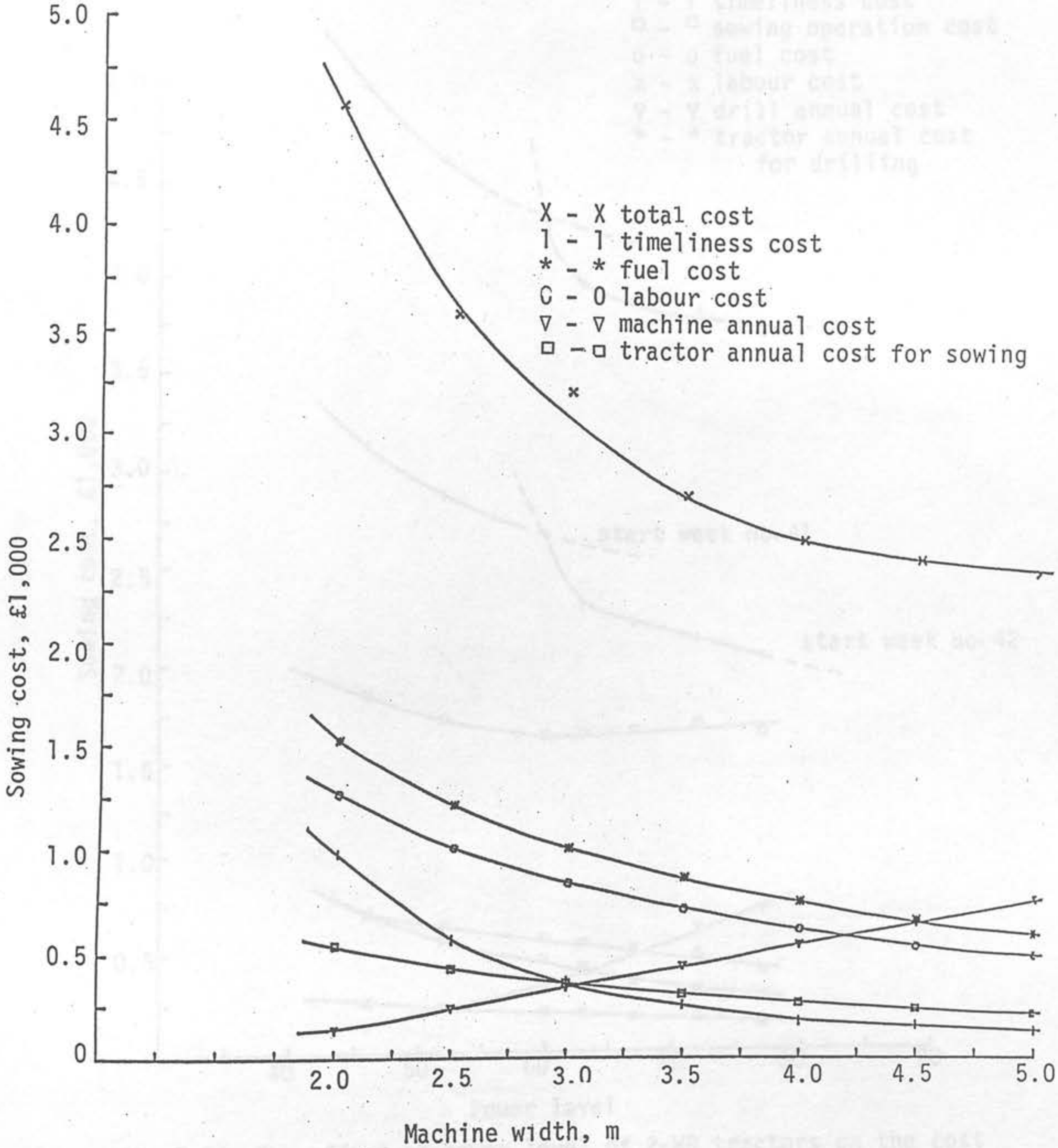


Fig 8.12 The effect of machine width on various sowing costs for 200 ha using a 55 kW 2-wheel drive tractor at forward speed of 4.90 km/h, a soil workability criterion of 110% and probability level of 90%

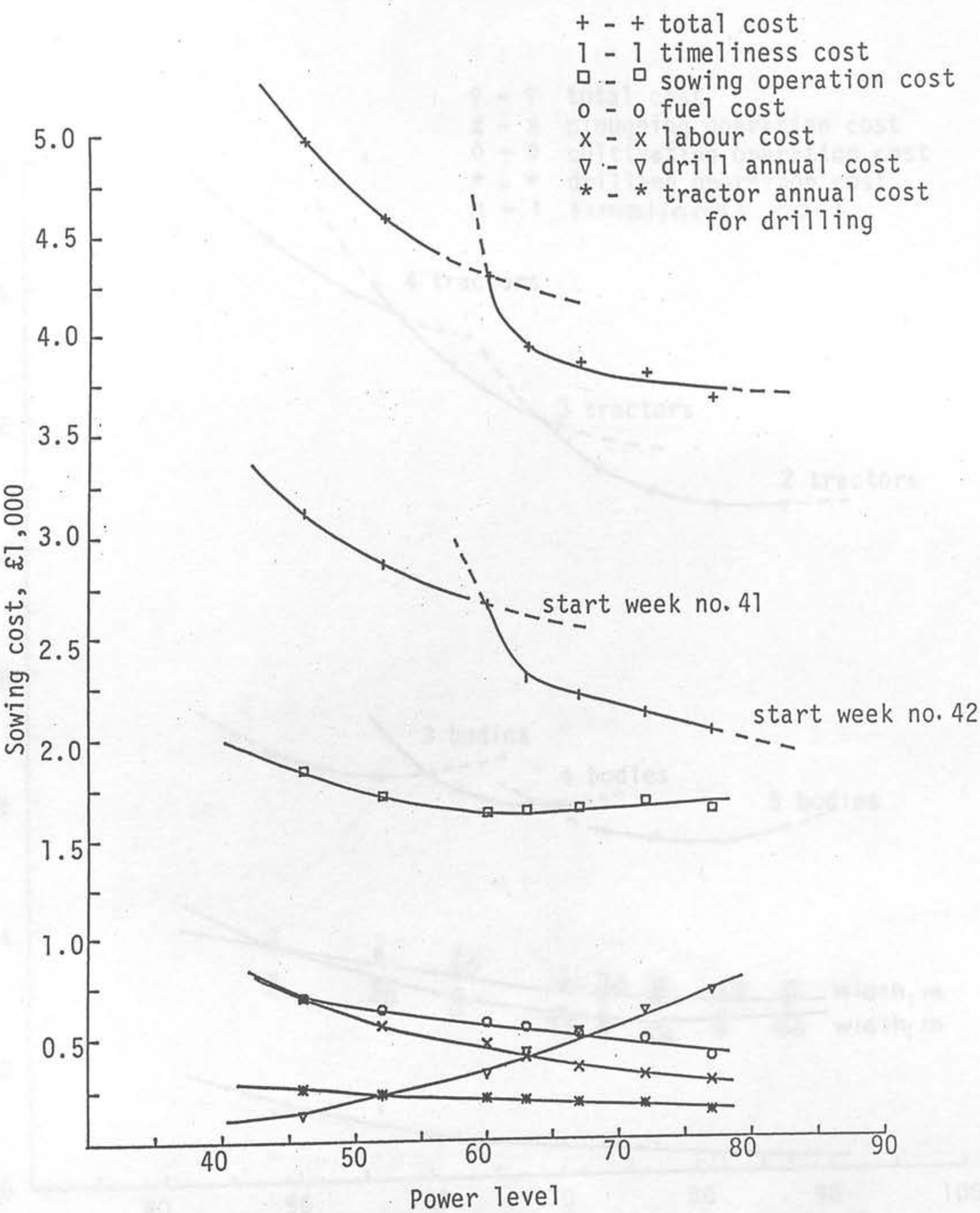


Fig 8.13 The effect of power level of 2-WD tractors on the cost of sowing 100 ha of winter wheat on Winton soil series with a soil workability criterion of 105%, probability level of 90%, operations started at week numbers 41 and 42 and the optimum sowing day no. 296.

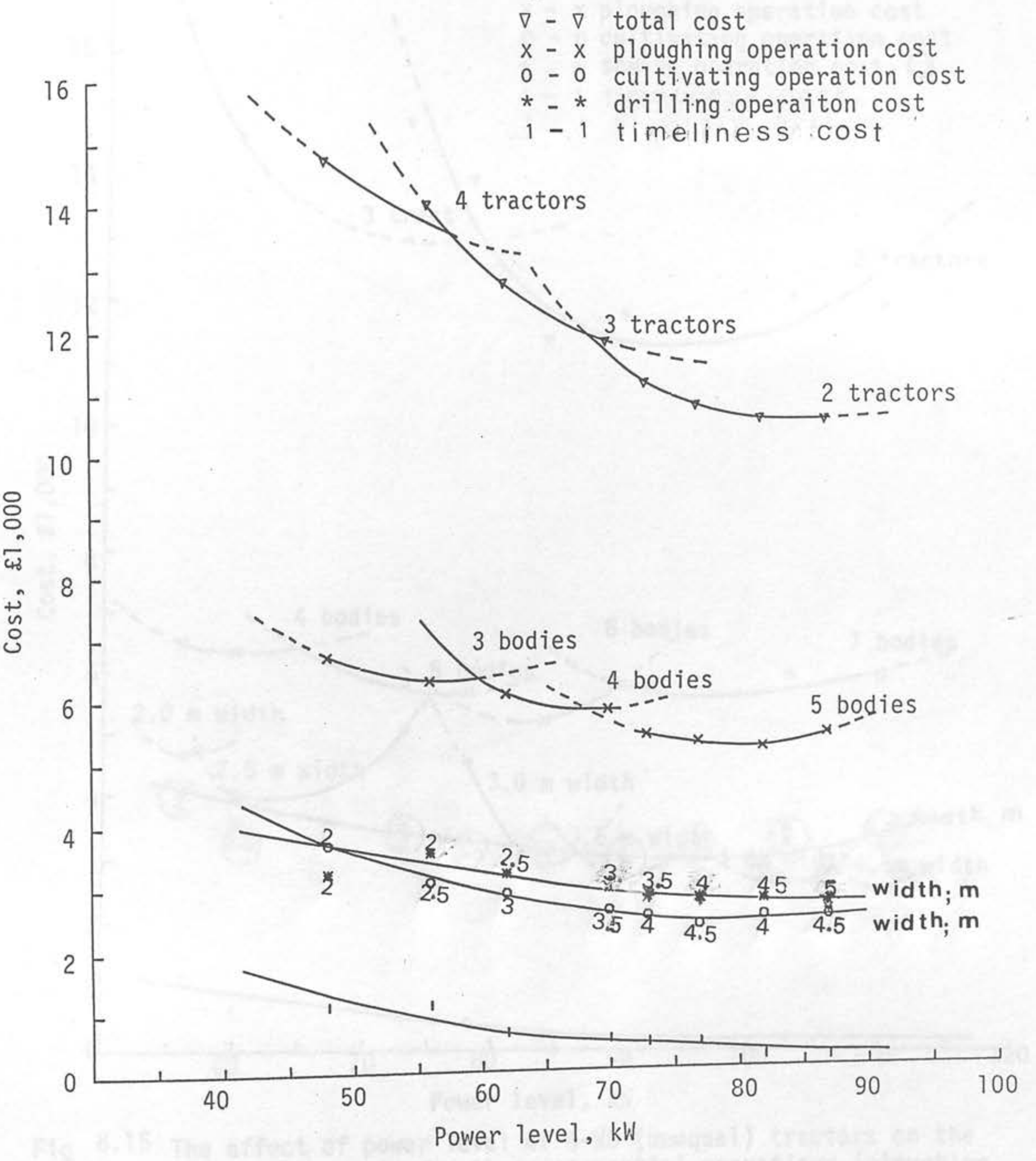


Fig 8.14 The effect of power level of 2-WD tractors on the accumulated costs for three sequential operations (ploughing, cultivating and sowing) started at week no. 39 for an area of 200 ha of winter wheat on Winton soil series with a soil W. criterion of 110% of field capacity and workday probability of 90%.

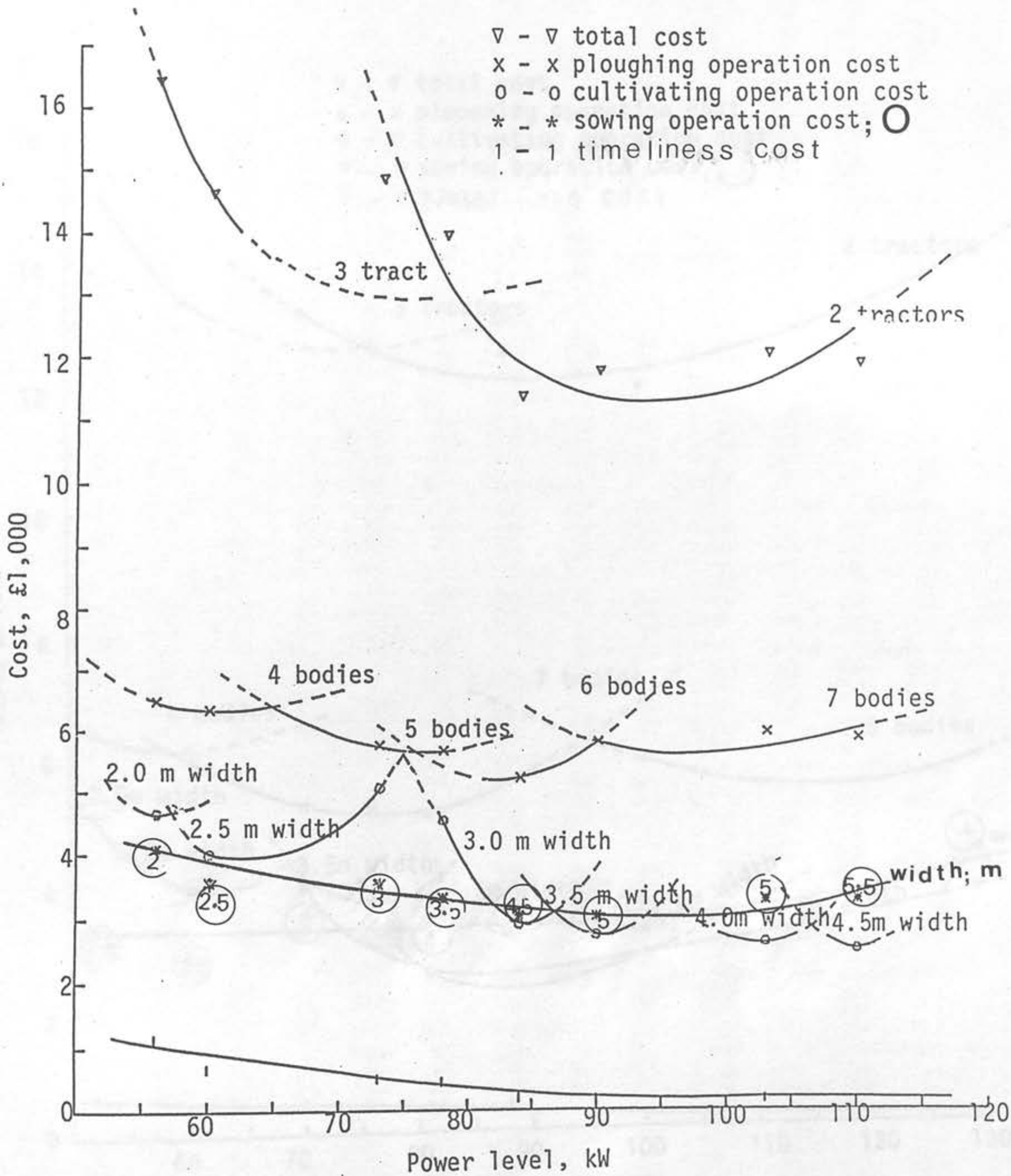


Fig 8.15 The effect of power level of 4-WD (unequal) tractors on the accumulated costs for three sequential operations (ploughing, cultivating and sowing) started at week no. 39 for an area of 200 ha of winter wheat on Winton soil series with a soil W. criterion of 110% of field capacity, workday probability of 90%.

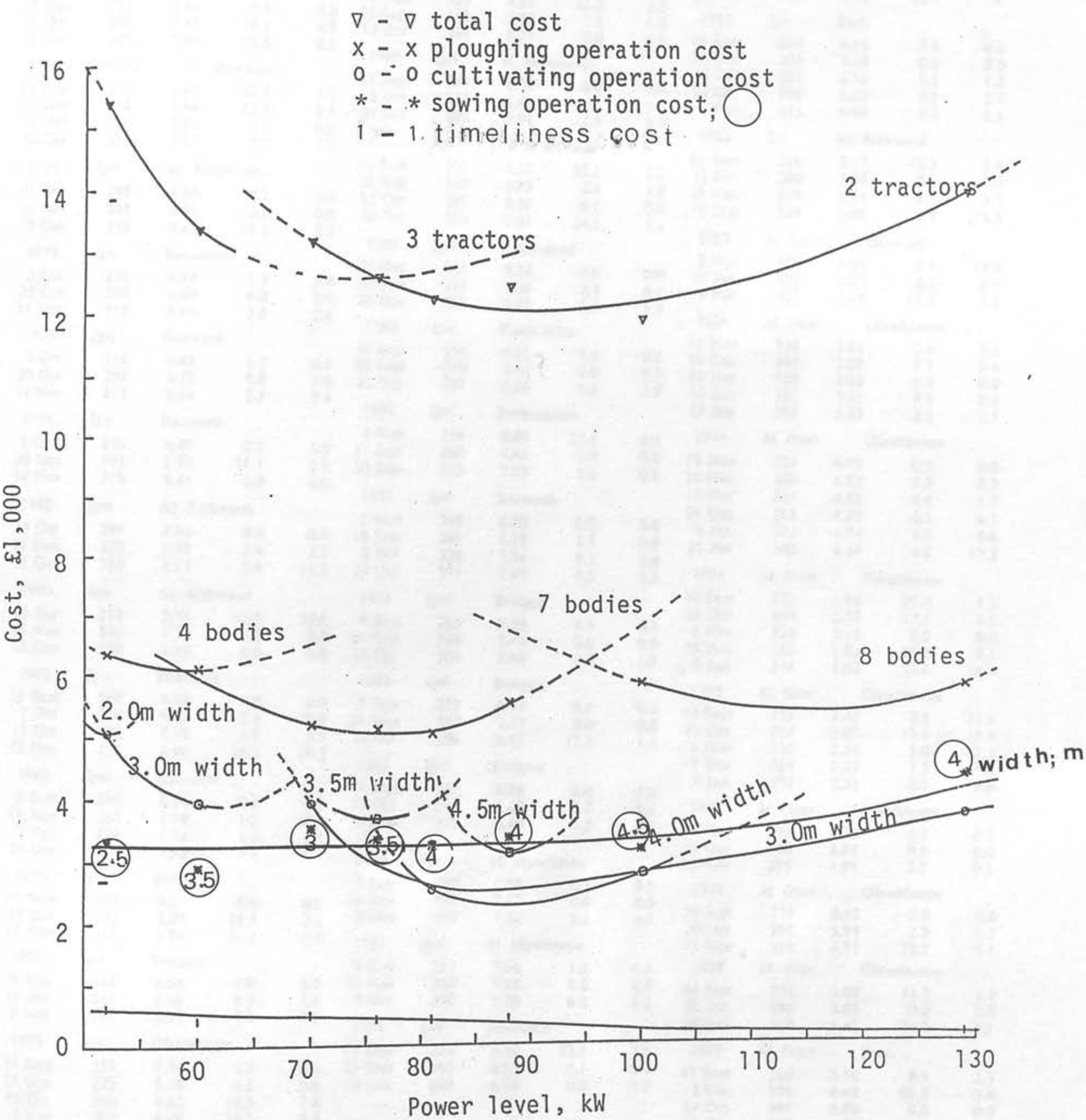


Fig 8.16 The effect of power level of 4-WD (equal) tractors on the accumulated costs for three sequential operations (ploughing, cultivating and sowing) started at week no. 39 for an area of 200 ha of winter wheat on Winton soil series with a soil W. criterion of 110% of field capacity and workday probability of 90%.

APPENDIX 1

ANNEX 1 Winter barley: percentage yield loss from untimely establishment.

Sowing day, Date	No	Yield, t/ha	Yield loss, % Exp.	Calc.
1978	*Athene*	Craibstone		
28 Sept	271	5.08	0.0	0.0
19 Oct	292	4.26	16.1	1.7
9 Nov	313	3.01	40.7	6.8
1980	*Athene*	Gleadthorpe		
14 Sept	258	9.12	0.0	0.0
28 Sept	272	8.24	9.6	0.8
16 Oct	290	7.47	18.1	3.9
2 Nov	307	7.06	22.6	8.8
1980	*Athene*	H. Mowthorpe		
11 Sept	255	2.99	22.1	3.2
25 Sept	268	2.94	23.4	1.1
13 Oct	287	3.84	0.0	0.0
30 Oct	304	3.57	7.0	1.1
1979	*Igri*	Ar. Rickwood		
15 Oct	288	4.60	8.2	3.0
15 Nov	319	5.01	0.0	0.0
15 Dec	349	4.48	10.6	3.5
1979	*Igri*	Boxworth		
3 Oct	276	6.54	5.2	0.9
20 Oct	293	6.90	0.0	0.0
14 Nov	318	6.64	3.8	2.4
1979	*Igri*	Boxworth		
3 Oct	276	6.42	1.2	0.9
20 Oct	293	6.50	0.0	0.0
14 Nov	318	6.34	2.5	2.4
1979	*Igri*	Boxworth		
3 Oct	276	6.40	0.2	5.5
20 Oct	393	5.70	11.1	1.9
14 Nov	318	6.41	0.0	0.0
1980	*Igri*	Ar. Rickwood		
15 Oct	289	4.96	0.0	0.0
15 Nov	320	4.79	3.4	3.7
15 Dec	350	4.57	7.9	14.3
1980	*Igri*	Ar. Rickwood		
15 Sep	259	2.74	42.9	25.6
15 Nov	320	4.75	1.0	2.8
15 Dec	350	4.80	0.0	0.0
1980	*Igri*	Boxworth		
18 Sept	262	8.23	0.0	0.0
2 Oct	276	8.21	0.2	0.8
18 Oct	292	7.99	2.9	3.4
28 Nov	333	6.90	16.2	19.3
1980	*Igri*	Boxworth		
5 Sept	249	8.28	0.0	0.0
18 Sept	262	8.18	1.2	0.6
2 Oct	276	7.74	6.5	2.8
24 Oct	298	7.49	9.5	9.2
1980	*Igri*	Bridgets		
21 Sept	265	7.31	0.0	0.0
18 Oct	292	5.24	28.3	2.8
13 Nov	318	5.04	31.1	10.8
1980	*Igri*	Bridgets		
24 Sept	268	6.88	0.0	0.0
13 Oct	287	6.42	6.7	1.4
6 Nov	311	6.37	7.4	7.1
1980	*Igri*	Gleadthorpe		
14 Sept	258	7.74	0.0	0.0
28 Sept	272	7.39	4.5	0.8
16 Oct	290	6.62	14.5	2.6
2 Nov	307	6.49	16.1	9.2

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1980	*Igri*	Gleadthorpe		
11 Sept	255	4.79	22.6	3.2
25 Sept	269	5.79	6.5	1.0
13 Oct	287	6.19	0.0	0.0
1980	*Igri*	Gleadthorpe		
11 Sept	255	4.97	22.0	3.2
25 Sept	269	5.89	7.5	1.0
13 Oct	287	6.37	0.0	0.0
1980	*Igri*	H. Mowthorpe		
23 Sept	267	6.71	0.0	0.0
9 Oct	283	6.41	4.5	1.0
31 Oct	305	5.91	11.9	5.5
1980	*Igri*	H. Mowthorpe		
11 Sept	255	4.53	22.3	3.2
25 Sept	269	5.69	2.4	1.0
13 Oct	287	5.83	0.0	0.0
30 Oct	304	5.01	14.1	1.1
1980	*Igri*	Rosemaund		
31 Oct	305	7.24	0.0	0.0
10 Nov	315	7.08	2.2	0.4
20 Nov	325	7.19	0.7	1.5
1980	*Igri*	South West		
10 Sept	254	6.11	8.3	0.8
26 Sept	270	6.66	0.0	0.0
23 Oct	297	6.56	1.5	2.8
1981	*Igri*	Bedfordshire		
3 Sept	246	6.00	23.4	0.6
17 Sept	260	7.83	0.0	0.0
30 Sept	273	7.63	2.6	0.6
1981	*Igri*	Boxworth		
5 Sept	248	8.28	0.0	0.0
18 Sept	261	8.18	1.2	0.6
2 Oct	275	7.74	6.5	2.8
24 Oct	297	7.49	9.5	9.2
1981	*Igri*	Bridgets		
9 Sept	252	6.80	9.1	0.9
26 Sept	269	7.48	0.0	0.0
13 Oct	286	6.86	8.3	1.1
1981	*Igri*	Bridgets		
9 Sept	252	6.79	9.1	0.7
24 Sept	267	7.47	0.0	0.0
13 Oct	286	6.55	12.3	1.4
1981	*Igri*	Bridgets		
24 Sept	267	6.90	0.0	0.0
13 Oct	286	6.40	7.2	1.4
6 Nov	310	6.40	7.2	7.1
1981	*Igri*	H. Mowthorpe		
9 Sept	252	7.70	0.3	0.5
22 Sept	265	7.72	0.0	0.0
9 Oct	282	7.32	5.2	1.1
1981	*Igri*	H. Mowthorpe		
9 Sept	252	7.66	1.5	0.5
22 Sept	265	7.78	0.0	0.0
9 Oct	282	7.30	6.2	1.1
1981	*Igri*	Pebmarsh		
11 Sept	254	4.30	27.1	2.6
25 Sept	268	5.60	5.1	0.7
10 Oct	283	5.90	0.0	0.0

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1982	*Igri*	Bush		
18 Sept	261	4.05	24.0	0.4
29 Sept	272	5.33	0.0	0.0
13 Oct	286	4.73	11.3	0.8
28 Oct	301	4.53	15.0	3.2
12 Nov	316	4.12	22.7	7.4
1982	*Igri*	Bush		
16 Sept	259	6.88	5.8	0.6
30 Sept	273	7.30	0.0	0.0
18 Oct	291	6.75	7.5	1.2
25 Oct	298	6.63	9.2	2.4
9 Nov	313	6.64	9.0	6.1
1983	*Igri*	Ar. Rickwood		
15 Sept	258	2.77	48.3	2.8
15 Oct	288	5.36	0.0	0.0
15 Nov	319	5.14	4.1	3.7
15 Dec	349	5.00	6.7	14.3
1967	*M. Otter*	Boxworth		
2 Nov	306	3.24	0.3	17.9
17 Jan	382	3.25	0.0	0.0
6 Feb	402	2.69	17.2	1.5
1974	*M. Otter*	Gleadthorpe		
12 Nov	316	3.61	0.6	5.5
10 Dec	344	3.32	8.5	0.6
24 Dec	358	3.63	0.0	0.0
18 Jan	383	3.31	8.8	2.4
25 Jan	390	3.33	8.3	3.9
1974	*M. Otter*	Gleadthorpe		
19 Nov	323	4.79	0.0	0.0
26 Nov	330	4.63	3.3	0.2
10 Dec	344	4.58	4.4	1.7
24 Dec	358	4.49	6.3	4.7
8 Jan	373	4.74	1.0	9.6
25 Jan	390	4.56	4.8	17.2
1975	*M. Otter*	Gleadthorpe		
30 Sept	273	1.96	20.0	4.2
21 Oct	294	2.03	17.1	0.8
6 Nov	310	2.45	0.0	0.0
19 Dec	353	1.83	25.3	7.1
9 Jan	374	1.53	37.6	15.7
1975	*M. Otter*	Gleadthorpe		
30 Sept	273	2.43	3.2	31.6
21 Oct	294	2.07	17.5	19.8
6 Nov	310	2.31	8.0	12.7
19 Dec	353	2.33	7.2	1.4
9 Jan	374	2.51	0.0	0.0
1977	*M. Otter*	Gleadthorpe		
22 Oct	295	4.76	5.7	0.3
31 Oct	304	5.05	0.0	0.0
11 Nov	315	4.89	3.2	0.5
1978	*M. Otter*	Gleadthorpe		
30 Sept	273	6.12	0.0	0.0
20 Oct	293	5.94	2.9	1.5
15 Nov	319	4.77	22.1	8.1
1978	*M. Otter*	Gleadthorpe		
30 Sept	273	5.02	14.2	1.2
20 Oct	293	5.85	0.0	0.0
15 Nov	319	4.43	24.3	2.[illegible]
1979	*M. Otter*	Bush		
17 Sept	260	5.40	8.5	2.3
3 Oct	276	4.40	25.4	0.4
14 Oct	287	5.90	0.0	0.0
29 Oct	302	4.50	23.7	0.9

ANNEX 1 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1980	*M. Otter*	Eastern Region		
11 Sept	255	5.23	10.8	0.5
24 Sept	286	5.86	0.0	0.0
15 Oct	289	5.75	1.9	1.7
1980	*M. Otter*	Gleadthorpe		
14 Sept	258	7.27	0.0	0.0
28 Sept	272	6.81	6.3	0.8
16 Oct	290	6.25	14.0	3.9
2 Nov	307	6.49	10.7	9.2
1981	*M. Otter*	Cambridgeshire		
11 Sept	254	5.33	10.3	0.5
24 Sept	267	5.94	0.0	0.0
15 Oct	288	5.85	1.5	1.7
1981	*M. Otter*	Gleadthorpe		
11 Sept	254	3.94	28.9	3.2
25 Sept	268	4.97	10.3	1.0
13 Oct	286	5.54	0.0	0.0
30 Oct	303	4.19	24.4	1.1
1966	*Peniarth*	Boxworth		
25 Oct	298	4.04	0.0	0.0
4 Jan	369	3.96	2.0	19.3
17 Feb	413	3.48	13.9	50.7
1967	*Peniarth*	Boxworth		
2 Nov	306	3.52	0.0	0.0
17 Jan	382	2.65	24.7	22.2
6 Feb	402	2.34	33.5	35.4
1977	*Sonja*	Gleadthorpe		
22 Oct	295	4.91	0.0	0.0
31 Oct	304	4.52	7.9	0.3
11 Nov	315	4.48	8.8	1.5
1978	*Sonja*	Gleadthorpe		
30 Sept	273	4.25	28.2	1.2
20 Oct	293	5.92	0.0	0.0
15 Nov	319	4.60	22.3	2.6
1978	*Sonja*	Gleadthorpe		
30 Sept	273	4.21	7.7	1.2
20 Oct	293	4.56	0.0	0.0
15 Nov	319	4.45	2.4	2.6
1979	*Sonja*	Gleadthorpe		
2 Oct	275	6.42	0.0	0.0
16 Oct	289	5.83	9.2	0.8
31 Oct	304	5.20	19.0	3.2
1979	*Sonja*	Gleadthorpe		
2 Oct	275	6.70	10.7	2.6
16 Oct	289	6.80	9.3	0.7
31 Oct	304	7.50	0.0	0.0
1979	*Sonja*	H. Mowthorpe		
11 Oct	284	5.18	0.0	0.0
24 Oct	297	4.27	17.6	0.6
20 Nov	324	1.60	69.1	6.1
1980	*Sonja*	Gleadthorpe		
25 Sept	269	6.63	0.0	0.0
16 Oct	290	5.15	22.3	1.7
29 Oct	303	5.40	18.6	4.4
1980	*Sonja*	H. Mowthorpe		
26 Sept	270	4.94	0.0	0.0
18 Oct	292	4.61	6.7	1.9
29 Oct	303	4.24	14.2	4.2
1980	*Sonja*	H. Mowthorpe		
11 Sept	255	3.92	16.2	7.4
25 Sept	269	4.39	6.2	3.8
13 Oct	287	4.48	4.3	0.9
30 Oct	304	4.68	0.0	0.0
1980	*Sonja*	Northern		
12 Sept	256	6.23	0.0	0.0
29 Sept	273	5.79	7.1	1.1
14 Oct	288	5.43	12.8	3.9
1981	*Sonja*	H. Mowthorpe		
23 Sep	266	6.71	0.0	0.0
9 Oct	282	6.41	4.5	1.0
31 Oct	304	5.91	11.9	5.5

ANNEX 2 Winter wheat: percentage yield loss from untimely establishment.

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1981	*Aquila*	Bush		
9 Sept	252	9.40	0.0	0.0
29 Sept	272	9.20	2.1	1.7
20 Oct	293	9.00	4.3	7.3
4 Dec	338	7.90	16.0	32.2
1981	*Aquila*	Bush		
9 Sept	252	10.1	0.0	0.0
30 Sept	273	9.80	3.0	1.9
22 Oct	295	9.40	6.9	8.1
2 Dec	336	8.60	14.9	31.0
1982	*Aquila*	Bush		
15 Oct	288	3.70	9.5	0.3
23 Oct	296	4.09	0.0	0.0
9 Nov	313	3.59	12.2	1.3
4 Dec	338	3.59	12.2	7.7
14 Dec	348	3.36	17.8	11.8
1980	*Armada*	Boxworth		
26 Sept	270	7.47	4.2	5.1
16 Oct	290	7.57	2.9	0.9
30 Oct	304	7.80	0.0	0.0
1973	*Atou*	Boxworth		
26 Sept	269	5.37	4.8	3.2
23 Oct	296	5.64	0.0	0.0
22 Nov	326	5.32	5.7	3.9
1973	*Atou*	Boxworth		
15 Oct	288	6.35	0.2	3.5
28 Oct	301	6.30	0.9	1.0
12 Nov	316	6.36	0.0	0.0
13 Dec	347	6.20	2.5	4.2
1973	*Atou*	Bridgets		
20 Sept	263	1.61	44.7	9.8
12 Oct	285	2.25	22.7	3.0
6 Nov	310	2.91	0.0	0.0
1973	*Atou*	Drayton		
15 Sept	258	4.75	0.0	0.0
6 Oct	279	4.73	0.4	1.9
26 Oct	299	4.33	8.8	7.3
1973	*Atou*	High Mowthorpe		
22 Sept	265	3.83	0.0	0.0
19 Oct	292	3.70	3.4	3.2
23 Nov	327	3.67	4.2	16.7
1973	*Atou*	Rosemaund		
28 Sept	271	4.93	10.8	1.8
18 Oct	291	5.54	0.0	0.0
9 Nov	313	4.39	20.6	2.1
1975	*Atou*	Ar. Rickwood		
14 Oct	287	3.71	27.8	1.0
29 Oct	302	5.14	0.0	0.0
27 Nov	331	4.79	6.8	3.7
1975	*Atou*	Boxworth		
25 Oct	298	6.16	2.1	4.6
26 Nov	330	6.29	0.0	0.0
14 Jan	379	5.12	18.6	10.4
1975	*Atou*	Bridgets		
10 Oct	283	6.27	1.4	9.8
26 Nov	330	6.36	0.0	0.0
18 Dec	352	6.10	4.1	2.1
1975	*Atou*	Drayton		
17 Sept	260	3.93	6.7	2.0
8 Oct	281	4.21	0.0	0.0
25 Oct	298	4.16	1.2	1.3
1975	*Atou*	H. Mowthorpe		
10 Oct	283	5.93	2.8	11.1
25 Oct	298	5.82	4.6	5.4
29 Nov	333	6.10	0.0	0.0
1975	*Atou*	Rosemaund		
26 Sept	269	4.95	0.0	0.0
15 Oct	288	4.12	16.8	1.6
29 Nov	333	4.38	11.5	17.8
1977	*Atou*	Ar. Rickwood		
8 Oct	281	6.63	0.3	3.0
3 Nov	307	6.65	0.0	0.0
3 Dec	337	5.06	23.9	3.9
1977	*Atou*	Boxworth		
11 Oct	284	6.65	5.0	39.2
2 Nov	306	6.22	11.1	23.0
22 Nov	326	6.26	10.6	12.0
13 Jan	378	7.00	0.0	0.0
1978	*Atou*	Ar. Rickwood		
20 Oct	293	5.17	0.0	0.0
14 Nov	318	4.63	10.4	2.7
13 Dec	347	4.56	11.8	12.7

ANNEX 2 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1981	*Avalon*	Bush		
9 Sept	252	7.90	23.3	7.5
29 Sept	272	9.60	6.8	2.0
20 Oct	293	10.3	0.0	0.0
4 Dec	338	7.90	23.3	8.8
1981	*Avalon*	Bush		
9 Sept	252	8.80	4.3	2.0
30 Sept	273	9.20	0.0	0.0
22 Oct	295	8.30	9.8	2.1
2 Dec	336	7.40	19.6	17.3
1982	*Avalon*	East Region		
10 Sept	253	7.27	14.4	0.9
24 Sept	267	8.49	0.0	0.0
11 Oct	284	7.27	14.4	1.3
1980	*Bounty*	Boxworth		
26 Sept	270	7.46	8.5	5.1
16 Oct	290	7.34	9.9	0.9
30 Oct	304	8.15	0.0	0.0
1980	*Bounty*	Bridgets		
23 Sept	267	6.30	12.5	2.6
17 Oct	291	7.20	0.0	0.0
9 Nov	314	5.80	19.4	2.3
1981	*Bounty*	Boxworth		
5 Sept	248	9.56	1.0	0.9
19 Sept	262	9.66	0.0	0.0
3 Oct	276	9.03	6.5	0.9
12 Oct	285	9.12	5.6	2.3
1981	*Bounty*	Boxworth		
12 Sept	255	8.41	0.0	0.0
24 Sept	267	7.27	13.6	0.6
11 Oct	284	8.24	2.0	3.7
1981	*Bounty*	Bridgets		
23 Sept	266	6.60	0.0	0.0
17 Oct	290	5.70	13.6	2.5
9 Nov	313	5.50	16.7	9.6
1981	*Bounty*	Bush		
9 Sept	252	8.90	2.2	2.0
30 Sept	273	9.10	0.0	0.0
22 Oct	295	8.30	8.8	2.1
2 Dec	336	6.70	26.4	17.3
1981	*Bounty*	Eastern Region		
10 Sept	253	8.41	1.2	4.3
24 Sept	267	8.39	1.4	1.3
11 Oct	284	8.51	0.0	0.0
1981	*Bounty*	Terrington		
6 Sept	249	8.68	5.8	1.6
15 Sept	258	8.34	9.4	0.4
25 Sept	268	9.21	0.0	0.0
7 Oct	280	9.10	1.2	0.6
1982	*Bounty*	Bridgets		
23 Sept	266	8.90	0.0	0.0
17 Oct	290	7.80	12.4	2.5
9 Nov	313	6.60	25.8	9.6
1982	*Bounty*	Terrington		
6 Sept	249	6.30	3.5	0.4
15 Sept	258	6.53	0.0	0.0
25 Sept	268	6.22	4.7	0.4
7 Oct	280	6.38	2.3	2.1

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1973	*Bouquet*	Boxworth		
26 Sept	269	5.16	0.0	0.0
23 Oct	296	4.93	4.5	3.2
22 Nov	326	4.82	6.6	14.1
1973	*Bouquet*	Bridgets		
20 Sept	263	2.23	30.7	9.8
12 Oct	285	2.66	17.4	2.8
6 Nov	310	3.22	0.0	0.0
1973	*Bouquet*	H. Mowthorpe		
27 Sept	265	3.52	5.1	3.2
19 Oct	292	3.71	0.0	0.0
23 Nov	327	3.17	14.6	5.4
1975	*Bouquet*	Ar. Rickwood		
14 Oct	287	3.04	38.8	1.0
29 Oct	302	4.97	0.0	0.0
27 Nov	331	4.38	11.9	3.7
1975	*Bouquet*	Boxworth		
25 Oct	298	6.08	4.7	4.5
26 Nov	330	6.38	0.0	0.0
14 Jan	379	5.02	21.3	10.4
1975	*Bouquet*	Bridgets		
10 Oct	283	6.43	0.0	0.0
26 Nov	330	6.38	0.8	9.6
18 Dec	352	5.94	7.6	20.7
1975	*Bouquet*	Drayton		
17 Sept	260	3.77	0.0	0.0
8 Oct	281	3.64	3.4	1.9
25 Oct	298	3.74	0.8	6.3
1975	*Bouquet*	H. Mowthorpe		
10 Oct	283	5.77	0.7	11.1
25 Oct	298	5.62	3.3	5.4
29 Nov	333	5.81	0.0	0.0
1975	*Bouquet*	Rosemaund		
29 Sept	272	3.98	8.5	16.5
15 Oct	288	4.06	6.7	9.1
29 Nov	333	4.35	0.0	0.0
1977	*Bouquet*	Ar. Rickwood		
8 Oct	281	5.79	2.5	3.0
3 Nov	307	5.94	0.0	0.0
3 Dec	337	5.09	14.3	3.9
1978	*Bouquet*	Ar. Rickwood		
20 Oct	293	5.07	0.0	0.0
14 Nov	318	4.68	7.7	2.7
13 Dec	347	4.13	18.5	12.7
1978	*Bouquet*	Drayton		
15 Sept	258	4.32	3.1	2.0
6 Oct	279	4.46	0.0	0.0
26 Oct	299	3.92	12.1	1.7
1972	*Cama*	Boxworth		
9 Oct	283	5.13	6.0	0.9
23 Oct	297	5.46	0.0	0.0
15 Nov	320	5.07	7.1	2.3
13 Dec	348	5.05	7.5	11.3
1966	*Cappelle Desprez*	Boxworth		
25 Oct	298	4.61	0.0	0.0
4 Jan	369	3.37	26.9	21.9
17 Feb	413	2.90	37.1	57.5

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1967	*Cappelle Desprez*	Boxworth		
2 Nov	306	3.46	0.0	0.0
17 Jan	382	1.82	47.4	25.1
6 Feb	402	1.24	64.2	40.1
1972	*Cappelle Desprez*	Boxworth		
9 Oct	283	5.01	7.4	0.9
23 Oct	297	5.41	0.0	0.0
15 Nov	320	5.05	6.6	2.3
13 Dec	348	5.04	6.8	11.3
1973	*Cappelle Desprez*	Boxworth		
26 Sept	269	5.17	0.0	0.0
23 Oct	296	4.55	12.0	3.2
22 Nov	326	4.06	21.5	14.1
1973	*Cappelle Desprez*	Bridgets		
20 Sept	263	1.82	40.5	9.8
12 Oct	285	2.60	15.0	2.8
6 Nov	310	3.06	0.0	0.0
1973	*Cappelle Desprez*	H. Mowthorpe		
22 Sept	265	3.59	0.0	0.0
19 Oct	292	3.23	10.0	3.2
23 Nov	327	2.96	17.5	16.7
1973	*Cappelle Desprez*	Rosemaund		
28 Sept	271	4.56	3.2	1.8
18 Oct	291	4.71	0.0	0.0
9 Nov	313	4.07	13.6	2.1
1975	*Cappelle Desprez*	Ar. Rickwood		
14 Oct	287	2.90	33.9	1.0
29 Oct	302	4.39	0.0	0.0
27 Nov	331	4.31	1.8	3.7
1975	*Cappelle Desprez*	Boxworth		
25 Oct	298	5.88	0.0	0.0
26 Nov	330	5.73	2.6	4.5
14 Jan	379	4.65	20.9	28.5
1975	*Cappelle Desprez*	Bridgets		
10 Oct	283	5.89	3.6	9.8
26 Nov	330	6.11	0.0	0.0
18 Dec	352	5.97	2.3	2.1
1975	*Cappelle Desprez*	Drayton		
17 Sept	260	3.68	2.1	2.0
8 Oct	281	3.76	0.0	0.0
25 Oct	298	3.31	12.0	1.3
1975	*Cappelle Desprez*	H. Mowthorpe		
10 Oct	283	5.53	2.8	11.1
25 Oct	298	5.48	3.7	5.4
29 Nov	333	5.69	0.0	0.0
1975	*Cappelle Desprez*	Rosemaund		
26 Sept	269	3.78	11.3	18.3
15 Oct	288	3.99	6.3	8.9
29 Nov	333	4.26	0.0	0.0
1968	*Champlein*	Gleadthorpe		
20 Sept	264	3.33	0.0	0.0
13 Oct	287	2.89	13.2	2.3
13 Nov	318	2.58	22.5	12.7
1969	*Champlein*	Gleadthorpe		
19 Sept	262	3.92	0.0	0.0
16 Oct	289	3.12	20.4	3.2
13 Nov	317	3.19	18.6	13.2

ANNEX 2 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1977	*Champlein*		Gleadthorpe	
22 Oct	295	5.13	0.0	0.0
31 Oct	304	5.09	0.8	0.4
11 Nov	315	4.73	7.8	1.8
1981	*CWW/1681/1*		Bush	
9 Sept	252	10.0	1.0	1.8
30 Sept	273	10.1	0.0	0.0
22 Oct	295	9.70	4.0	2.3
2 Dec	336	8.30	17.8	17.8
1981	*CWW/1681/1*		Bush	
9 Sept	252	9.80	1.0	1.8
29 Sept	272	9.90	0.0	0.0
20 Oct	293	9.50	4.0	1.9
4 Dec	338	9.00	9.1	18.9
1981	*CWW/1683/1*		Bush	
9 Sept	252	9.60	11.1	1.8
29 Sept	272	10.8	0.0	0.0
20 Oct	293	10.6	1.9	1.9
4 Dec	338	9.20	14.8	18.9
1980	*Flanders*		Boxworth	
26 Sept	270	6.60	10.1	5.1
16 Oct	290	6.49	11.6	0.9
30 Oct	304	7.34	0.0	0.0
1975	*Flinor*		Ar. Rickwood	
14 Oct	287	2.17	55.0	1.0
29 Oct	302	4.82	0.0	0.0
27 Nov	331	3.46	28.2	3.7
1975	*Flinor*		Boxworth	
25 Oct	298	6.33	0.0	0.0
26 Nov	330	6.21	1.9	4.5
14 Jan	379	5.06	20.1	28.5
1971	*Joss Cambier*		Boxworth	
2 Oct	275	4.48	1.1	2.0
23 Oct	296	4.53	0.0	0.0
13 Nov	317	3.90	13.2	2.0
1978	*Kinsman*		Boxworth	
20 Sept	263	6.07	1.3	1.8
10 Oct	283	6.15	0.0	0.0
20 Oct	293	5.52	10.2	0.4
1978	*Kinsman*		Boxworth	
20 Sept	263	5.70	1.7	1.8
10 Oct	283	5.80	0.0	0.0
20 Oct	293	5.42	6.6	0.4
1973	*M. Freeman*		Boxworth	
26 Sept	269	5.13	4.3	3.2
23 Oct	296	5.36	0.0	0.0
22 Nov	326	5.09	5.0	3.9
1973	*M. Freeman*		Bridgets	
20 Sept	263	1.64	45.3	9.8
12 Oct	285	2.28	24.0	2.8
6 Nov	310	3.00	0.0	0.0
1973	*M. Freeman*		Drayton	
15 Sept	258	4.46	7.3	2.0
6 Oct	279	4.81	0.0	0.0
26 Oct	299	4.57	5.0	1.7
1973	*M. Freeman*		H. Mowthorpe	
22 Sept	265	3.49	4.1	3.2
19 Oct	292	3.64	0.0	0.0
23 Nov	327	3.30	9.3	5.3

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1973	*M. Freeman*		Rosemaund	
28 Sept	271	5.18	3.2	1.8
18 Oct	291	5.35	0.0	0.0
9 Nov	313	4.32	19.3	2.1
1975	*M. Freeman*		Ar. Rickwood	
14 Oct	287	2.93	38.6	1.0
29 Oct	302	4.77	0.0	0.0
27 Nov	331	3.27	31.4	3.7
1975	*M. Freeman*		Bridgets	
10 Oct	283	6.35	4.4	21.1
26 Nov	330	6.45	2.9	2.1
18 Dec	352	6.64	0.0	0.0
1975	*M. Freeman*		Drayton	
17 Sept	260	3.34	14.4	6.4
8 Oct	281	3.84	1.5	1.3
25 Oct	298	3.90	0.0	0.0
1975	*M. Freeman*		H. Mowthorpe	
10 Oct	283	5.61	0.9	11.1
25 Oct	298	5.39	4.8	5.4
29 Nov	333	5.66	0.0	0.0
1975	*M. Freeman*		Rosemaund	
26 Sept	269	3.91	8.4	18.2
15 Oct	288	3.83	10.3	9.0
29 Nov	333	4.27	0.0	0.0
1979	*M. Freeman*		Boxworth	
25 Oct	298	5.54	3.3	4.5
26 Nov	330	5.73	0.0	0.0
14 Jan	379	5.18	9.6	10.4
1981	*M. Freeman*		Bush	
9 Sept	252	8.90	14.4	7.5
29 Sept	272	9.70	6.7	2.0
20 Oct	293	10.4	0.0	0.0
4 Dec	338	8.30	20.2	8.8
1981	*M. Freeman*		Bush	
9 Sept	252	9.00	2.2	2.0
30 Sept	273	9.20	0.0	0.0
22 Oct	295	8.50	7.6	2.1
2 Dec	336	7.30	20.7	17.3
1981	*M. Freeman*		Bush	
15 Oct	288	3.87	1.3	11.1
23 Oct	296	3.88	1.0	7.8
9 Nov	313	3.88	1.0	2.8
4 Dec	338	3.92	0.0	0.0
14 Dec	348	3.90	0.5	0.4
1975	*M. Fundin*		Ar. Rickwood	
14 Oct	287	1.42	56.0	1.0
29 Oct	302	3.23	0.0	0.0
27 Nov	331	3.01	6.8	3.7
1975	*M. Hobbit*		Ar. Rickwood	
14 Oct	287	2.74	52.1	1.0
29 Oct	302	5.72	0.0	0.0
27 Nov	331	4.46	22.0	3.7
1977	*M. Hobbit*		Ar. Rickwood	
8 Oct	281	6.84	0.0	0.0
3 Nov	307	6.55	4.2	3.0
3 Dec	337	6.06	11.4	13.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1978	*M. Hobbit*		Ar. Rickwood	
20 Oct	293	5.90	0.0	0.0
14 Nov	318	5.42	8.1	2.7
13 Dec	347	5.19	12.0	12.7
1979	*M. Hobbit*		Midlands	
5 Oct	278	8.97	5.9	4.6
12 Oct	285	8.97	5.9	2.8
6 Nov	310	9.53	0.0	0.0
1981	*M. Hobbit*		Bedfordshire	
5 Sept	248	9.56	1.0	0.9
19 Sept	262	9.66	0.0	0.0
3 Oct	276	9.08	6.0	0.9
21 Oct	294	9.12	5.6	2.3
1981	*M. Hobbit*		Bedfordshire	
28 Aug	240	8.90	1.1	2.1
4 Sept	247	8.90	1.1	1.0
19 Sept	262	9.00	0.0	0.0
3 Oct	276	8.50	5.6	0.9
16 Nov	320	8.50	5.6	14.6
1981	*M. Hobbit*		Terrington	
8 Sept	251	8.67	4.9	3.5
15 Sept	258	8.71	4.5	2.0
25 Sept	268	9.06	0.7	0.5
6 Oct	279	9.12	0.0	0.0
1973	*M. Huntsman*		Boxworth	
26 Sept	269	5.67	0.0	0.0
23 Oct	296	5.64	0.5	3.2
22 Nov	326	4.19	26.1	14.1
1973	*M. Huntsman*		Bridgets	
20 Sept	263	2.05	39.9	9.8
12 Oct	285	3.27	4.1	2.8
6 Nov	310	3.41	0.0	0.0
1973	*M. Huntsman*		Drayton	
15 Sept	258	5.05	6.3	7.5
6 Oct	279	5.33	1.1	1.8
26 Oct	299	5.39	0.0	0.0
1973	*M. Huntsman*		H. Mowthorpe	
22 Sept	265	4.15	8.2	17.1
19 Oct	292	4.37	3.3	5.4
23 Nov	327	4.52	0.0	0.0
1973	*M. Huntsman*		Rosemaund	
28 Sept	271	6.39	9.2	1.8
18 Oct	291	7.04	0.0	0.0
9 Nov	313	6.13	12.9	2.1
1975	*M. Huntsman*		Ar. Rickwood	
14 Oct	287	2.85	45.2	8.6
29 Oct	302	4.06	21.9	3.7
27 Nov	331	5.20	0.0	0.0
1975	*M. Huntsman*		Boxworth	
24 Oct	297	5.54	8.6	4.5
5 Nov	309	5.65	6.8	1.8
25 Nov	329	6.06	0.0	0.0
13 Dec	347	5.63	7.1	1.4
1975	*M. Huntsman*		Boxworth	
25 Oct	298	6.56	0.0	0.0
26 Nov	330	6.40	2.4	4.5
14 Jan	379	5.23	20.3	28.5
1975	*M. Huntsman*		Bridgets	
10 Oct	283	7.07	3.7	9.8
26 Oct	330	7.34	0.0	0.0
18 Dec	252	6.57	10.5	2.1

ANNEX 2 (Continued)

Sowing day,		Yield,	Yield loss, %	
Date	No.	t/ha	Exp.	Calc.
1975	*M. Huntsman*		Drayton	
17 Sept	260	3.72	11.8	2.0
8 Oct	281	4.22	0.0	0.0
25 Oct	298	4.20	0.5	1.3
1975	*M. Huntsman*		H. Mowthorpe	
10 Oct	283	6.17	0.0	0.0
25 Oct	298	5.83	5.5	1.0
29 Nov	333	5.98	3.1	10.9
1975	*M. Huntsman*		Rosemaund	
26 Sept	269	4.40	13.2	18.1
15 Oct	288	4.86	4.1	9.0
29 Nov	333	5.07	0.0	0.0
1977	*M. Huntsman*		Ar. Rickwood	
8 Oct	281	6.22	0.0	0.0
3 Nov	307	6.17	0.8	2.9
3 Dec	337	5.69	8.5	13.5
1977	*M. Huntsman*		Boxworth	
10 Nov	314	5.21	2.6	0.4
19 Nov	323	5.35	0.0	0.0
26 Nov	330	5.32	0.6	0.2
1977	*M. Huntsman*		Boxworth	
11 Oct	284	5.71	4.0	7.8
2 Nov	306	5.60	5.9	1.8
22 Nov	326	5.95	0.0	0.0
13 Jan	378	5.94	0.2	11.7
1977	*M. Huntsman*		Boxworth	
4 Nov	308	5.78	0.3	9.0
19 Dec	353	5.80	0.0	0.0
13 Jan	378	5.30	8.6	2.7
1977	*M. Huntsman*		Gleadthorpe	
22 Oct	295	5.10	0.0	0.0
31 Oct	304	5.05	1.0	0.4
11 Nov	315	4.63	9.2	1.7
1977	*M. Huntsman*		Midlands	
1 Oct	274	7.10	0.0	0.0
21 Oct	294	6.40	9.9	1.7
5 Nov	309	6.10	14.1	5.3
24 Nov	328	5.80	18.3	12.7
1978	*M. Huntsman*		Ar. Rickwood	
20 Oct	293	5.81	0.0	0.0
14 Nov	318	5.42	6.7	2.7
13 Dec	347	5.28	9.1	12.7
1978	*M. Huntsman*		H. Mowthorpe	
23 Sept	266	5.33	4.0	7.8
14 Oct	287	5.48	1.3	2.0
4 Nov	308	5.55	0.0	0.0
30 Nov	334	5.17	6.8	3.0
1978	*M. Huntsman*		ICI Midlands	
26 Sept	269	8.97	9.0	0.5
28 Sept	271	8.97	9.0	0.4
29 Sept	272	9.42	4.5	0.3
7 Oct	280	9.86	0.0	0.0
16 Oct	289	8.97	9.0	0.4
1978	*M. Huntsman*		Midlands	
30 Sept	273	7.10	1.4	1.6
11 Oct	284	7.10	1.4	0.3
19 Nov	292	7.20	0.0	0.0
5 Nov	309	6.50	9.7	1.3
1978	*M. Huntsman*		Midlands	
15 Oct	288	7.10	1.4	0.0
16 Oct	289	7.20	0.0	0.0
17 Oct	290	6.90	4.2	0.0
18 Oct	291	6.90	4.2	0.0

Sowing day,		Yield,	Yield loss, %	
Date	No.	t/ha	Exp.	Calc.
1978	*M. Huntsman*		Midlands	
30 Sept	273	6.28	1.7	1.6
11 Oct	284	6.28	1.7	0.3
19 Oct	292	6.39	0.0	0.0
5 Nov	309	5.83	8.8	1.3
1978	*M. Huntsman*		Midlands	
15 Oct	288	6.24	0.6	0.0
16 Oct	289	6.28	0.0	0.0
17 Oct	290	6.16	0.0	1.9
18 Oct	291	6.16	0.0	1.9
1979	*M. Huntsman*		Bush	
9 Sept	252	8.4	8.7	2.0
30 Sept	273	9.20	0.0	0.0
22 Oct	295	9.00	2.3	2.1
2 Dec	336	7.40	19.6	17.3
1979	*M. Huntsman*		ICI Midlands	
4 Oct	277	8.97	3.5	3.2
6 Oct	279	8.97	3.5	2.8
31 Oct	304	9.30	0.0	0.0
1979	*M. Huntsman*		ICI Midlands	
1 Oct	274	7.20	0.0	0.0
9 Oct	282	6.90	4.2	0.3
17 Oct	290	6.80	5.6	1.1
3 Nov	307	6.50	9.7	4.7
1981	*M. Huntsman*		H. Mowthorpe	
26 Sept	269	5.98	9.5	0.7
9 Oct	282	6.61	0.0	0.0
31 Oct	304	6.35	3.9	2.1
1972	*M. Ranger*		Boxworth	
9 Oct	283	5.13	6.9	6.1
23 Oct	297	5.44	1.3	2.3
15 Nov	320	5.51	0.0	0.0
13 Dec	348	5.26	4.5	3.4
1973	*M. Ranger*		Boxworth	
26 Sept	269	4.79	1.2	3.2
23 Oct	296	4.85	0.0	0.0
22 Nov	326	4.04	16.7	3.9
1973	*M. Ranger*		Bridgets	
20 Sept	263	1.60	48.2	9.8
12 Oct	285	2.31	25.2	2.8
6 Nov	310	3.09	0.0	0.0
1973	*M. Ranger*		Drayton	
15 Sept	258	4.48	5.7	2.0
6 Oct	279	4.75	0.0	0.0
26 Oct	299	4.59	3.4	1.7
1973	*M. Ranger*		H. Mowthorpe	
22 Sept	265	3.21	18.5	17.1
19 Oct	292	3.44	12.7	5.4
23 Nov	327	3.94	0.0	0.0
1973	*M. Ranger*		Rosemaund	
28 Sept	271	4.31	11.7	1.8
18 Oct	291	4.88	0.0	0.0
9 Nov	313	4.18	14.3	2.1
1975	*M. Ranger*		Ar. Rickwood	
14 Oct	287	2.51	38.3	1.0
29 Oct	302	4.07	0.0	0.0
27 Nov	331	3.59	11.8	3.7
1975	*M. Ranger*		Boxworth	
25 Oct	298	4.85	7.1	4.5
26 Nov	330	5.22	0.0	0.0
14 Jan	379	4.57	12.5	10.4

Sowing day,		Yield,	Yield loss, %	
Date	No.	t/ha	Exp.	Calc.
1975	*M. Ranger*		Bridgets	
10 Oct	283	5.77	10.4	21.1
26 Nov	330	6.41	0.5	2.1
18 Dec	352	6.44	0.0	0.0
1975	*M. Ranger*		Drayton	
17 Sept	260	3.30	13.2	2.0
8 Oct	281	3.80	0.0	0.0
25 Oct	298	3.62	4.7	1.3
1975	*M. Ranger*		H. Mowthorpe	
10 Oct	283	5.21	9.1	11.1
25 Oct	298	5.21	9.1	5.4
29 Nov	333	5.73	0.0	0.0
1975	*M. Ranger*		Rosemaund	
26 Sept	269	3.39	20.0	18.3
15 Oct	288	3.55	16.3	9.0
29 Nov	333	4.24	0.0	0.0
1967	*M. Widgeon*		Boxworth	
2 Nov	306	3.35	0.0	0.0
17 Jan	382	2.08	37.9	25.1
6 Feb	402	1.32	60.6	40.1
1973	*M. Widgeon*		Boxworth	
28 Sept	271	5.13	8.9	1.8
18 Oct	291	5.63	0.0	0.0
9 Nov	313	4.52	19.7	2.1
1973	*M. Widgeon*		Drayton	
15 Sept	258	4.72	0.0	0.0
6 Oct	279	4.62	2.1	1.9
26 Oct	299	3.51	25.6	7.3
1975	*M. Widgeon*		Drayton	
17 Sept	260	3.10	3.4	2.0
8 Oct	281	3.21	0.0	0.0
25 Oct	298	2.79	13.1	1.3
1975	*M. Widgeon*		Rosemaund	
26 Sept	269	3.56	11.4	18.2
15 Oct	288	3.92	2.5	9.0
29 Nov	333	4.02	0.0	0.0
1975	*Mega*		Ar. Rickwood	
14 Oct	287	3.66	21.8	1.0
29 Oct	302	4.68	0.0	0.0
27 Nov	331	3.61	22.8	3.7
1981	*Moulin*		Bush	
9 Sept	252	9.90	0.0	0.0
30 Sept	273	9.70	2.0	1.9
22 Oct	295	9.10	8.1	8.1
2 Dec	336	8.10	18.2	31.0
1981	*Moulin*		Bush	
9 Sept	252	9.30	7.0	7.5
29 Sept	272	9.70	3.0	2.0
20 Oct	293	10.0	0.0	0.0
4 Dec	338	8.90	11.0	8.8
1981	*Norman*		Bush	
9 Sept	252	10.3	4.6	2.0
30 Sept	273	10.8	0.0	0.0
22 Oct	295	9.60	11.1	2.1
2 Dec	336	8.10	25.0	17.3
1981	*Norman*		Bush	
9 Sep	252	9.50	9.5	1.8
29 Sept	272	10.50	0.0	0.0
20 Oct	293	10.30	1.9	1.9
4 Dec	338	8.30	21.0	18.9

ANNEX 2 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.	Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.	Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1966	*Perdix*	Ar. Rickwood			1975	*Templar*	Ar. Rickwood			1975	*Val*	Ar. Rickwood		
25 Oct	298	4.06	0.0	0.0	14 Oct	287	3.47	35.3	1.0	14 Oct	287	2.32	46.5	8.6
4 Jan	369	3.14	22.7	21.9	29 Oct	302	5.36	0.0	0.0	29 Oct	302	2.57	40.8	3.7
17 Feb	413	2.78	31.5	57.5	27 Nov	331	3.74	30.2	3.7	27 Nov	331	4.34	0.0	0.0

ANNEX 3 Spring barley: percentage yield losses from untimely establishment.

1976	*Abacus*	Craibstone		
1 Mar	60	6.41	0.0	0.0
8 Mar	67	5.86	8.6	0.5
15 Mar	74	5.15	19.6	2.2
22 Mar	81	5.16	19.5	4.9
5 April	95	5.29	17.5	13.5
19 April	109	5.76	10.1	26.5
26 Apr	116	5.23	18.4	34.5
3 May	123	5.03	21.5	43.7
1976	*Abacus*	Craibstone		
1 Mar	61	5.48	0.0	0.0
8 Mar	68	4.76	13.1	0.5
15 Mar	75	4.88	10.9	2.2
22 Mar	82	4.75	13.3	4.9
29 Mar	89	4.91	10.4	8.6
5 Apr	96	5.19	5.3	13.5
12 Apr	103	4.92	10.2	19.4
19 Apr	110	4.03	26.5	26.5
26 Apr	117	3.30	39.8	34.5
3 May	124	2.66	51.5	43.7
1977	*Abacus*	Craibstone		
8 Mar	67	5.06	7.8	0.4
15 Mar	73	5.49	0.0	0.0
22 Mar	81	5.19	5.5	0.5
29 Mar	88	4.71	14.2	2.2
5 Apr	95	4.87	11.3	4.9
12 Apr	102	5.17	5.8	8.6
19 Apr	109	4.74	13.7	13.5
26 Apr	116	4.46	18.8	19.4
3 May	123	4.06	26.0	26.5
1978	*Aramir*	Eastern Region		
1 Mar	60	5.55	0.0	0.0
10 Mar	69	5.21	6.1	0.9
29 Mar	88	3.29	40.7	8.6
1978	*Ark Royal*	Eastern Region		
1 Mar	60	5.34	0.0	0.0
10 Mar	69	5.31	0.6	0.9
29 Mar	88	3.82	28.5	8.6
1973	*Berac*	Gleadthorpe		
10 Jan	10	4.66	2.3	6.6
25 Jan	25	4.66	2.3	1.3
6 Feb	37	4.77	0.0	0.0
20 Feb	51	4.37	8.4	2.2
9 Mar	68	4.01	15.9	10.6
16 Mar	75	4.00	16.1	15.9
1974	*Berac*	Gleadthorpe		
24 Dec	−7	3.59	5.5	18.5
18 Jan	18	3.41	10.3	3.6
25 Jan	25	3.51	7.6	1.5
7 Feb	38	3.8	0.0	0.0
14 Feb	45	3.58	5.8	0.5
7 Mar	66	3.04	20.0	8.6
1974	*Berac*	Gleadthorpe		
24 Dec	−7	4.85	3.6	9.3
18 Jan	18	4.86	3.4	0.4
25 Jan	25	5.03	0.0	0.0
7 Feb	38	4.81	4.4	1.9
14 Feb	45	5.02	0.2	4.4
7 Mar	66	4.42	12.1	18.5
1975	*Berac*	Gleadthorpe		
19 Dec	−12	2.38	2.1	4.0
9 Jan	9	2.43	0.0	0.0
24 Jan	24	1.86	23.5	2.5
6 Feb	37	2.11	13.2	8.6
20 Feb	51	1.98	18.5	19.4
6 Mar	65	1.31	46.1	34.5
20 Mar	79	1.04	57.2	54.0
1964	*Cambrinus*	Boxworth		
10 Mar	70	3.62	9.7	8.8
10 Apr	101	4.01	0.0	0.0
28 Apr	119	3.75	6.5	3.6
1965	*Cambrinus*	Boxworth		
10 Mar	69	4.51	9.4	4.0
31 Mar	90	4.98	0.0	0.0
28 Apr	118	4.64	6.8	8.6
1966	*Cambrinus*	Boxworth		
11 Mar	70	4.46	6.3	4.0
1 Apr	91	4.76	0.0	0.0
28 Apr	118	4.29	9.9	8.0
1966	*Deba Abed*	Boxworth		
11 Mar	70	4.89	2.0	4.0
1 Apr	91	4.99	0.0	0.0
28 Apr	118	4.35	12.8	8.0
1968	*Deba Abed*	Ar. Rickwood		
6 Mar	66	3.38	7.1	3.6
26 Mar	86	3.64	0.0	0.0
23 Apr	114	1.75	51.9	8.6
1969	*Deba Abed*	Boxworth		
5 Mar	64	3.56	6.6	7.7
3 Apr	93	3.81	0.0	0.0
6 May	126	3.77	1.0	12.0
1978	*Deba Abed*	Boxworth		
5 Mar	64	4.49	0.0	0.0
1 Apr	91	3.49	22.3	8.0
2 May	122	1.68	62.6	37.1
1964	*Europa*	Boxworth		
10 Mar	70	3.78	4.1	8.8
10 Apr	101	3.94	0.0	0.0
28 Apr	119	3.78	4.1	3.6
1965	*Europa*	Boxworth		
10 Mar	69	4.39	7.0	4.0
31 Mar	90	4.72	0.0	0.0
28 Apr	118	4.58	3.0	8.6
1977	*Golden Promise*	Nairnside		
30 Mar	89	2.89	44.8	11.3
13 Apr	103	4.02	23.3	3.9
18 Apr	108	3.97	24.2	2.2
3 May	123	5.24	0.0	0.0
9 May	129	3.08	41.2	0.4
10 May	130	3.67	30.0	0.5
1978	*Golden Promise*	Craibstone		
1 Mar	60	3.86	13.1	0.4
8 Mar	67	4.44	0.0	0.0
15 Mar	74	4.12	7.2	0.5
22 Mar	81	4.28	3.6	2.2
29 Mar	88	3.82	14.0	4.9
5 Apr	95	3.83	13.7	8.6
12 Apr	102	3.85	13.3	13.5
19 Apr	109	3.81	14.2	19.4
26 Apr	116	3.40	23.4	26.5
3 May	123	3.33	25.0	34.5
1979	*Golden Promise*	Craibstone		
12 Apr	102	4.48	7.4	0.4
19 Apr	109	4.84	0.0	0.0
26 Apr	116	4.12	14.9	0.5
3 May	123	3.72	23.1	2.2
10 May	130	3.59	25.8	4.9
17 May	137	2.85	41.1	8.6
1980	*Golden Promise*	Craibstone		
1 Mar	61	5.03	0.0	0.0
8 Mar	68	4.04	19.7	0.5
15 Mar	75	3.03	39.8	2.2
29 Mar	89	3.93	21.9	8.6
5 Apr	96	3.80	24.5	13.5
12 Apr	103	3.83	23.9	19.4
19 Apr	110	3.55	29.4	26.5
26 Apr	117	2.91	42.1	34.5
3 May	124	1.91	62.0	43.7
1981	*Golden Promise*	Craibstone		
1 Mar	60	5.18	11.6	7.1
8 Mar	67	4.87	16.9	4.0
15 Mar	74	5.10	13.0	1.8
22 Mar	81	5.85	22.4	0.4
29 Mar	88	5.86	0.0	0.0
5 Apr	95	5.80	1.0	0.5
12 Apr	102	5.08	13.3	2.2
19 Apr	109	4.13	29.5	4.9
26 Apr	116	4.77	18.6	8.6
3 May	123	4.30	26.6	13.5
1982	*Golden Promise*	Craibstone		
1 Mar	60	4.40	0.0	0.0
8 Mar	67	3.58	18.6	0.5
15 Mar	74	4.17	5.2	2.2
22 Mar	81	3.63	17.5	4.9
29 Mar	88	3.48	20.9	8.6
5 Apr	95	3.70	15.9	13.5
12 Apr	102	3.74	15.0	19.4
9 Apr	109	2.38	45.9	26.5
26 Apr	116	2.26	48.6	34.5
3 May	123	1.83	58.4	43.7

ANNEX 3 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1979	*M. Otter*	Bush		
22 Mar	81	6.00	0.0	0.0
17 Apr	107	5.50	8.3	7.4
21 Apr	111	5.00	16.7	9.9
27 Apr	117	4.00	33.3	14.3
1980	*M. Otter*	Lothian		
31 Mar	91	5.10	0.0	0.0
7 Apr	98	5.00	2.0	0.5
15 Apr	106	4.52	11.4	2.5
15 May	136	4.09	19.8	22.3
1978	*Midas*	Craibstone		
1 Mar	60	4.14	12.1	11.2
8 Mar	67	4.45	5.5	7.1
15 Mar	74	4.18	11.3	4.0
22 Mar	81	4.33	8.1	1.8
29 Mar	88	4.18	11.3	0.4
5 Apr	95	4.71	0.0	0.0
12 Apr	102	4.18	11.3	0.5
19 Apr	109	4.60	2.3	2.2
26 Apr	116	4.55	3.4	4.9
3 May	123	4.64	1.5	8.6
1979	*Midas*	Craibstone		
12 Apr	102	4.53	0.0	0.0
19 Apr	109	4.20	7.3	0.5
26 Apr	116	3.89	14.1	2.2
3 May	123	3.91	13.7	4.9
10 May	130	3.87	14.6	8.6
17 May	137	2.56	43.5	13.5
1980	*Midas*	Craibstone		
1 Mar	61	4.56	0.7	7.1
8 Mar	68	3.13	31.8	4.0
15 Mar	75	3.17	30.9	1.8
29 Mar	89	4.59	0.0	0.0
5 Apr	96	4.50	2.0	0.5
12 Apr	103	4.28	6.8	2.2
19 Apr	110	4.07	11.3	4.9
26 Apr	117	3.38	26.4	8.6
3 May	124	2.30	49.9	13.5
1981	*Midas*	Craibstone		
1 Mar	60	5.58	12.3	7.1
8 Mar	67	5.25	17.5	4.0
15 Mar	74	5.26	17.3	1.8
22 Mar	81	5.75	9.6	0.4
29 Mar	88	6.36	0.0	0.0
5 Apr	95	5.78	9.2	0.5
12 Apr	102	6.09	4.2	2.2
19 Apr	109	5.50	13.5	4.9
26 Apr	116	5.53	13.1	8.6
3 May	123	5.13	19.3	13.5
1982	*Midas*	Craibstone		
1 Mar	60	5.56	0.0	0.0
8 Mar	67	4.47	19.6	0.5
15 Mar	74	4.66	16.2	2.2
22 Mar	81	4.11	26.1	4.9
29 Mar	88	3.73	32.9	8.6
5 Apr	95	4.06	37.0	13.5
12 Apr	102	3.90	29.9	19.4
19 Apr	109	3.15	43.3	26.5
26 Apr	116	2.79	49.8	34.5
3 May	123	2.20	59.7	43.7
1964	*Pallas*	Boxworth		
10 Mar	70	3.31	16.4	8.8
10 Apr	101	3.96	0.0	0.0
28 Apr	119	3.85	2.8	3.6
1968	*Pikka*	NOSCA(Nairnside)		
Apr	92	2.57	6.5	2.1
16 Apr	107	2.75	0.0	0.0
1 May	122	2.44	11.3	2.5
1964	*Proctor*	Boxworth		
10 Mar	70	3.57	3.3	8.8
10 Apr	101	3.69	0.0	0.0
28 Apr	119	3.48	5.7	3.6
1956	*Proctor*	Boxworth		
10 Mar	69	4.88	0.0	0.0
31 Mar	90	4.25	12.9	4.9
28 Apr	118	4.15	15.0	26.4
1966	*Proctor*	Boxworth		
11 Mar	70	4.71	0.0	0.0
1 Apr	91	4.47	5.1	4.9
28 Apr	118	3.84	18.5	25.4
1966	*Proctor*	Bridgets		
4 Mar	63	3.79	0.0	0.0
28 Mar	87	3.78	0.3	6.3
26 Apr	116	2.44	35.6	30.9
1967	*Proctor*	Bridgets		
8 Feb	39	3.14	18.9	10.5
14 Mar	73	3.87	0.0	0.0
19 Apr	109	2.01	48.1	14.3
1968	*Proctor*	Bridgets		
16 Feb	47	3.95	0.0	0.0
13 Mar	73	3.70	6.3	7.4
23 Apr	114	2.83	28.4	49.4
1971	*Proctor*	Craibstone		
8 Mar	67	4.24	15.5	1.8
15 Mar	74	4.80	4.4	0.4
22 Mar	81	5.02	0.0	0.0
5 Apr	95	4.63	7.8	2.2
12 Apr	102	4.88	3.0	4.9
19 Apr	109	4.17	16.9	8.6
26 Apr	116	4.80	4.4	13.5
3 May	123	4.17	16.9	19.4
10 May	130	3.47	30.9	26.5
17 May	137	3.44	31.5	34.5
1968	*Sultan*	Boxworth		
5 Mar	65	3.83	0.0	0.0
1 Apr	92	3.27	14.6	8.0
2 May	123	2.23	41.8	37.1
1971	*Ymer*	Craibstone		
8 Mar	67	4.42	13.5	16.1
22 Mar	81	4.80	6.1	7.1
29 Mar	88	4.88	4.5	4.0
5 Apr	95	4.83	5.5	1.8
12 Apr	102	4.97	2.7	0.4
19 Apr	109	5.11	0.0	0.0
26 Apr	116	4.66	8.8	0.5
3 May	123	4.55	11.0	2.2
10 May	130	3.74	26.8	4.9
17 May	137	4.24	17.0	8.6
1972	*Ymer*	Craibstone		
1 Mar	61	5.00	17.6	4.0
8 Mar	68	4.67	23.1	1.8
15 Mar	75	5.63	7.2	0.4
22 Mar	82	6.07	0.0	0.0
29 Mar	89	4.92	18.9	0.5
5 Apr	96	4.84	20.3	2.2
12 Apr	103	5.00	17.6	4.9
19 Apr	110	5.44	10.4	8.6
26 Apr	117	5.34	12.0	13.5
3 May	124	5.52	25.5	19.4
1973	*Ymer*	Craibstone		
8 Mar	67	3.72	7.7	0.4
15 Mar	74	4.03	0.0	0.0
22 Mar	81	3.90	3.2	0.5
29 Mar	88	3.92	2.7	2.2
5 Apr	95	3.80	5.7	4.9
12 Apr	102	3.87	4.0	8.6
19 Apr	109	3.51	12.9	13.5
26 Apr	116	3.68	8.9	19.4
3 May	123	3.38	16.1	26.4
10 May	130	4.00	0.7	34.5
17 May	137	3.68	8.7	43.7
1974	*Ymer*	Craibstone		
8 Mar	67	5.49	2.7	0.4
15 Mar	74	5.64	0.0	0.0
29 Mar	88	5.20	7.8	2.2
5 Apr	95	5.20	7.8	4.9
12 Apr	102	4.84	14.2	8.6
19 Apr	109	4.51	20.0	13.5
26 Apr	116	4.57	19.0	19.4
3 May	123	3.92	30.5	26.5
1966	*Zephyr*	Boxworth		
11 Mar	70	4.94	0.0	0.0
1 Apr	91	4.85	1.8	4.9
28 Apr	118	4.32	12.6	25.4
1968	*Zephyr*	Boxworth		
5 Mar	65	4.07	0.0	0.0
1 Apr	92	3.62	11.1	8.0
2 May	123	2.19	46.2	37.1
1968	*Zephyr*	Bridgets		
16 Feb	47	4.05	0.0	0.0
13 Mar	73	3.89	4.0	7.4
23 Apr	114	3.07	24.2	49.4

ANNEX 3 (Continued)

Sowing day,		Yield,	Yield loss, %	
Date	No.	t/ha	Exp.	Calc.
1983	*Golden Promise*	Craibstone		
1 Mar	60	4.15	27.4	16.1
8 Mar	67	4.45	22.2	11.2
15 Mar	74	4.69	18.0	7.1
22 Mar	81	4.05	29.2	4.0
29 Mar	88	4.60	19.6	1.8
5 Apr	95	4.64	18.9	0.4
12 Apr	102	5.72	0.0	0.0
19 Apr	109	4.81	15.9	0.6
26 Apr	116	5.11	10.7	2.2
3 May	123	4.76	16.8	4.9
1983	*Golf*	Craibstone		
1 Mar	60	5.77	6.2	16.1
8 Mar	67	5.50	10.6	11.2
15 Mar	74	5.19	15.6	7.1
22 Mar	81	4.41	28.3	4.0
29 Mar	88	4.89	20.5	1.8
5 Apr	95	5.49	10.7	0.4
12 Apr	102	6.15	0.0	0.0
19 Apr	109	5.79	5.9	0.5
26 Apr	116	5.53	10.1	2.2
3 May	123	5.63	8.5	4.9
1965	*Impala*	Boxworth		
10 Mar	69	4.86	0.4	4.0
31 Mar	90	4.88	0.0	0.0
28 Apr	118	4.63	5.1	8.6
1965	*Impala*	Boxworth		
11 Mar	70	4.65	1.9	4.0
1 Apr	91	4.74	0.0	0.0
28 Apr	118	4.13	12.9	8.0
1966	*Impala*	Bridgets		
4 Mar	63	3.73	3.6	5.2
28 Mar	87	3.87	0.0	0.0
26 Apr	116	2.66	31.3	9.3
1966	*Impala*	H. Mowthorpe		
9 Mar	68	4.03	4.9	3.3
28 Mar	87	4.26	0.0	0.0
27 Apr	117	3.75	12.0	9.9
1967	*Impala*	Boxworth		
15 Mar	74	3.77	2.8	17.6
4 Apr	94	3.70	4.6	5.2
28 Apr	118	3.88	0.0	0.0
1967	*Impala*	Bridgets		
8 Feb	39	3.34	13.5	10.5
14 Mar	73	3.86	0.0	0.0
19 Apr	109	1.56	59.6	14.3
1967	*Impala*	H. Mowthorpe		
6 Mar	65	4.86	0.0	0.0
20 Mar	79	4.53	6.8	2.2
26 Apr	116	4.31	11.3	28.5
1968	*Impala*	Boxworth		
4 Mar	64	4.09	0.0	0.0
4 Apr	95	3.33	18.6	10.6
3 May	124	1.95	52.3	39.6
1968	*Impala*	Bridgets		
16 Feb	47	3.73	0.0	0.0
13 Mar	73	3.59	3.8	7.4
23 Apr	114	2.69	27.9	49.4
1968	*Impala*	H. Mowthorpe		
6 Mar	66	2.81	0.0	0.0
27 Mar	87	2.57	8.5	4.9
23 Apr	114	2.05	27.0	25.4
1969	*Impala*	Boxworth		
26 Mar	85	3.61	0.0	0.0
8 Apr	98	3.28	9.1	1.9
30 Apr	120	3.26	9.7	13.5
1968	*Julia*	Boxworth		
5 Mar	65	4.17	0.0	0.0
1 Apr	92	3.73	10.6	8.0
2 May	123	2.45	41.2	37.1
1973	*Julia*	Gleadthorpe		
10 Jan	10	3.54	5.6	2.1
25 Jan	25	3.75	0.0	0.0
6 Feb	37	3.72	0.8	1.6
20 Feb	51	3.62	3.5	7.4
9 Mar	68	3.62	3.5	20.4
16 Mar	75	3.56	5.1	27.5
1973	*Julia*	H Mowthorpe		
7 Mar	66	3.68	1.3	0.6
12 Mar	71	3.59	3.8	0.1
15 Mar	74	3.73	0.0	0.0
19 Mar	78	3.43	8.0	0.2
22 Mar	81	3.69	1.1	0.5
27 Mar	86	3.43	8.0	1.6
1974	*Lofa Abed*	Gleadthorpe		
18 Jan	18	5.12	1.2	3.6
7 Feb	38	5.18	0.0	0.0
7 Mar	66	4.58	11.6	8.6
1975	*Lofa Abed*	Gleadthorpe		
9 Jan	9	1.28	0.0	0.0
24 Jan	24	1.11	13.3	2.5
6 Feb	37	1.06	17.2	8.6
6 Mar	65	1.26	0.8	34.5
1972	*M. Mink*	Craibstone		
1 Mar	61	4.12	25.4	36.2
8 Mar	68	4.26	22.8	28.6
15 Mar	75	5.27	4.5	21.9
22 Mar	82	5.08	8.0	16.1
29 Mar	89	4.28	22.5	11.2
5 Apr	96	3.93	28.8	7.1
12 Apr	103	4.48	18.8	4.0
19 Apr	110	4.87	11.8	1.8
26 May	117	5.23	5.3	0.4
3 May	124	5.52	0.0	0.0
1973	*M. Mink*	Craibstone		
8 Mar	67	5.33	7.1	7.1
15 Mar	74	5.28	8.0	4.0
22 Mar	81	5.27	8.2	1.8
29 Mar	88	4.45	22.5	0.4
5 Apr	95	5.74	0.0	0.0
12 Apr	102	4.85	15.5	0.5
19 Apr	109	4.84	15.7	2.2
3 May	123	4.90	14.6	8.6
10 May	130	4.76	17.1	13.5
1974	*M. Mink*	Craibstone		
8 Mar	67	6.34	0.3	1.8
22 Mar	81	6.36	0.0	0.0
29 Mar	88	5.45	14.3	0.5
5 Apr	95	5.33	16.2	2.2
12 Apr	102	5.32	16.4	4.9
19 Apr	109	4.95	22.2	8.8
26 Apr	116	5.22	17.9	13.5
3 May	123	4.82	24.2	19.4
1975	*M. Mink*	Craibstone		
1 Mar	60	5.92	0.0	0.0
8 Mar	67	5.13	13.3	0.5
15 Mar	74	4.70	20.6	2.2
22 Mar	81	4.68	20.9	4.9
5 Apr	95	5.15	13.0	13.5
19 Apr	109	5.58	5.7	26.5
26 Apr	116	5.60	5.4	34.5
3 May	123	4.99	15.7	43.7
1976	*M. Mink*	Craibstone		
1 Mar	60	3.86	19.6	16.1
8 Mar	67	4.47	6.9	11.2
15 Mar	74	4.43	7.7	7.1
22 Mar	81	4.23	11.9	4.0
29 Mar	88	4.76	0.8	1.8
5 Apr	95	4.66	2.9	0.4
12 Apr	102	4.80	0.0	0.0
19 Apr	109	3.86	19.6	0.5
26 Apr	116	3.44	28.3	2.2
3 May	123	2.30	52.1	4.9
1977	*M. Mink*	Craibstone		
8 Mar	67	5.23	0.0	0.0
15 Mar	74	4.97	5.0	0.5
22 Mar	81	4.47	14.5	2.2
29 Mar	88	4.44	15.1	4.9
5 Apr	95	4.68	10.5	8.6
12 Apr	102	4.36	16.6	13.5
19 Apr	109	4.21	19.5	19.4
26 Apr	116	4.03	22.9	26.5
3 May	123	2.95	43.6	34.5
1969	*M. Otter*	Bush		
28 Mar	87	6.10	7.6	0.9
7 Apr	97	6.60	0.0	0.0
14 Apr	104	6.50	1.5	0.5
1970	*M. Otter*	Bush		
20 Mar	79	5.50	0.0	0.0
1 Apr	91	4.30	21.8	1.6
15 Apr	105	4.30	21.8	7.4
1970	*M. Otter*	Eastern Region		
1 Mar	60	4.09	0.0	0.0
15 Mar	74	3.92	4.2	2.2
1 Apr	91	3.70	9.5	10.6
15 Apr	105	3.36	17.8	22.3
1 May	121	2.24	45.2	41.0
1970	*M. Otter*	H. Mowthorpe		
22 Mar	81	5.47	0.0	0.0
27 Mar	86	5.28	3.5	0.3
29 Mar	88	5.30	3.1	0.5
1 Apr	91	5.18	5.3	1.1
4 Apr	94	5.07	7.3	1.9
8 Apr	98	4.92	10.1	3.2
11 Apr	101	4.99	8.8	4.4
1974	*M. Otter*	Craibstone		
1 Mar	60	4.33	0.0	0.0
15 Mar	74	4.06	6.2	2.2
29 Mar	88	3.90	9.9	8.6
19 Apr	109	3.86	10.9	26.4
3 May	123	3.45	20.3	43.7
1978	*M. Otter*	Eastern Region		
1 Mar	60	5.03	0.0	0.0
10 Mar	69	4.75	5.6	0.9
29 Mar	88	3.67	27.0	8.6

ANNEX 4 Spring wheat: percentage yield losses from untimely establishment.

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1980	*Highburg*	Ar. Rickwood		
18 Jan	18	4.79	0.0	0.0
18 Feb	49	4.72	1.5	10.5
20 Mar	80	4.29	10.4	41.9
1964	*Jufyl*	Boxworth		
10 Mar	70	2.68	22.5	21.1
10 Apr	101	2.98	13.9	2.8
28 Apr	119	3.46	0.0	0.0
1965	*Kloka*	Boxworth		
10 Mar	69	4.20	0.0	0.0
31 Mar	90	3.97	5.5	4.8
28 Apr	118	4.14	1.4	26.2
1966	*Kloka*	Ar. Rickwood		
8 Mar	67	3.66	11.6	3.9
29 Mar	88	4.14	0.0	0.0
26 Apr	116	3.60	13.0	8.5
1966	*Kloka*	Boxworth		
11 Mar	70	4.22	0.5	20.2
1 Apr	91	3.45	18.6	6.4
28 Apr	118	4.24	0.0	0.0
1967	*Kloka*	Terrington		
14 Feb	45	3.16	2.5	7.9
16 Mar	75	3.24	0.0	0.0
17 Apr	107	3.17	2.2	11.2
1968	*Kloka*	Ar. Rickwood		
6 Mar	66	3.02	0.0	0.0
26 Mar	86	2.69	10.9	4.4
23 Apr	114	1.98	34.4	25.1
1968	*Kloka*	Bridgets		
19 Feb	51	3.04	0.0	0.0
14 Mar	74	2.95	3.0	6.3
23 Apr	114	1.63	46.4	44.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1966	*Koga II*	Ar. Rickwood		
8 Mar	67	2.96	30.0	3.9
29 Mar	88	4.23	0.0	0.0
26 Apr	116	3.20	24.3	8.5
1968	*Koga II*	Ar. Rickwood		
7 Mar	66	2.91	0.0	0.0
26 Mar	86	2.72	6.5	4.4
23 Apr	114	1.38	52.6	25.1
1966	*Kolibri*	Ar. Rickwood		
8 Mar	67	3.66	23.1	3.9
29 Mar	88	4.76	0.0	0.0
26 Apr	116	3.80	20.2	8.5
1968	*Kolibri*	Ar. Rickwood		
6 Mar	66	3.13	4.6	3.5
26 Mar	86	3.28	0.0	0.0
23 Apr	114	1.92	41.5	8.5
1968	*Kolibri*	Boxworth		
5 Mar	65	3.26	0.0	0.0
1 Apr	92	2.80	14.1	7.9
2 May	123	1.54	52.8	36.6
1964	*Opal*	Boxworth		
10 Mar	70	3.06	18.8	21.1
10 Apr	101	3.07	18.6	2.8
28 Apr	119	3.77	0.0	0.0
1965	*Opal*	Boxworth		
10 Mar	69	4.44	0.0	0.0
31 Mar	90	4.22	5.0	4.8
28 Apr	118	3.95	11.0	26.2

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1966	*Opal*	Ar. Rickwood		
8 Mar	67	3.10	19.1	3.9
29 Mar	88	3.83	0.0	0.0
26 Apr	116	3.00	21.7	8.5
1966	*Opal*	Boxworth		
11 Mar	70	3.66	0.0	0.0
1 Apr	91	3.32	9.3	4.8
28 Apr	118	3.59	1.9	25.1
1968	*R. Sprite*	Ar. Rickwood		
6 Mar	66	2.99	0.0	0.0
26 Mar	86	2.84	4.3	4.4
23 Apr	114	1.58	47.2	29.5
1968	*R. Sprite*	Boxworth		
5 Mar	65	3.00	0.0	0.0
1 Apr	92	2.44	18.7	7.9
2 May	123	1.31	56.3	36.6
1968	*R. Sprite*	Bridgets		
19 Feb	50	2.93	0.0	0.0
14 Mar	74	2.54	13.3	6.3
23 Apr	114	2.01	31.4	44.6
1978	*Timmo*	Ar. Rickwood		
15 Feb	46	4.20	6.0	7.4
15 Mar	75	4.47	0.0	0.0
15 Apr	105	4.46	0.2	9.8
1979	*Timmo*	Ar. Rickwood		
5 Apr	95	5.10	0.0	0.0
12 Apr	102	4.86	4.7	0.5
19 Apr	109	4.38	14.1	2.1
1980	*Timmo*	Ar. Rickwood		
18 Jan	18	4.54	14.0	8.4
18 Feb	49	5.28	0.0	0.0
20 Mar	80	4.40	16.7	10.5

ANNEX 5 Oats: percentage yield losses from untimely estblishment.

1972	*Astor*	Craibstone		
1 Mar	61	4.19	3.9	2.6
8 Mar	68	3.94	9.6	0.7
15 Mar	75	4.36	0.0	0.0
22 Mar	82	4.11	5.7	1.0
29 Mar	89	3.75	14.0	3.8
5 Apr	96	3.59	17.7	8.6
12 Apr	103	3.30	24.3	15.2
19 Apr	110	2.61	40.1	23.8
26 Apr	117	2.59	40.6	34.2
3 May	124	2.17	50.2	46.6
1973	*Astor*	Craibstone		
8 Mar	67	4.65	4.3	2.6
15 Mar	74	4.16	14.4	0.7
22 Mar	81	4.86	0.0	0.0
29 Mar	87	4.49	7.6	1.0
5 Apr	95	4.52	7.0	3.8
12 Apr	102	3.91	19.5	8.6
19 Apr	109	3.91	19.5	15.2
26 Apr	116	3.88	20.2	23.8
3 May	123	2.15	55.8	34.2

1974	*Astor*	Craibstone		
8 Mar	67	4.98	10.3	2.6
22 Mar	81	5.55	0.0	0.0
29 Mar	88	5.46	1.6	1.0
5 Apr	95	5.28	4.8	3.8
12 Apr	102	4.23	23.8	8.6
19 Apr	109	3.85	30.6	15.2
26 Apr	116	3.99	28.1	23.8
3 May	123	2.76	50.3	34.2
1975	*Astor*	Craibstone		
1 Mar	60	3.91	15.6	2.6
8 Mar	67	3.89	16.0	0.7
15 Mar	74	4.63	0.0	0.0
22 Mar	81	3.84	17.1	1.0
5 Apr	95	3.62	21.8	8.6
19 Apr	109	3.63	21.6	23.8
26 Apr	116	3.14	32.2	34.2
3 May	123	2.15	53.7	46.6

1976	*Astor*	Craibstone		
1 Mar	61	3.62	13.6	23.7
8 Mar	68	3.70	11.7	16.5
15 Mar	75	3.64	13.1	10.5
22 Mar	82	3.70	11.7	5.9
29 Mar	88	3.59	14.3	2.6
5 Apr	96	3.26	32.3	0.7
12 Apr	103	4.19	0.0	0.0
19 Apr	110	2.84	32.2	1.0
26 Apr	117	2.68	36.0	3.8
3 May	124	1.75	58.2	8.6
1977	*Astor*	*Craibstone*		
8 Mar	67	6.36	0.0	0.0
15 Mar	74	5.29	16.8	1.0
22 Mar	81	4.41	30.7	3.8
29 Mar	88	4.16	34.6	8.6
5 Apr	95	3.89	38.8	15.2
12 Apr	102	3.81	40.1	23.8
19 Apr	109	3.69	42.0	34.2
26 Apr	116	3.60	43.4	46.6
3 May	123	2.40	62.3	60.9

ANNEX 5 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1967	*Blenda*	Craibstone		
1 Mar	60	4.25	15.5	42.2
8 Mar	67	4.25	15.5	32.3
15 Mar	74	4.26	15.3	23.7
22 Mar	81	4.25	15.5	16.5
29 Mar	88	4.66	7.4	10.5
5 Apr	95	4.68	7.0	5.9
12 Apr	102	4.76	5.4	2.6
19 Apr	109	4.70	6.6	0.7
26 Apr	116	5.03	0.0	0.0
3 May	123	3.98	20.9	1.0
1968	*Blenda*	Craibstone		
1 Mar	61	2.50	26.0	0.7
8 Mar	68	3.38	0.0	0.0
15 Mar	75	2.69	20.4	1.0
22 Mar	82	2.93	13.3	3.8
29 Mar	89	2.61	22.8	8.6
12 Apr	103	2.74	18.9	23.8
19 Apr	110	2.98	11.8	34.2
26 Apr	117	2.95	12.7	46.6
3 May	124	2.40	29.0	60.9
1969	*Blenda*	Craibstone		
8 Mar	67	3.80	0.0	0.0
22 Mar	81	2.80	26.3	3.8
29 Mar	88	1.91	49.7	8.6
5 Apr	95	2.64	30.5	15.2
12 Apr	102	2.52	33.7	23.8
19 Apr	109	2.71	28.7	34.2
26 Apr	116	2.19	42.4	46.6
3 May	123	3.35	11.8	60.9
1970	*Blenda*	Craibstone		
15 Mar	74	4.69	6.9	23.7
22 Mar	81	4.96	1.6	16.5
29 Mar	88	5.03	0.2	10.5
5 Apr	95	4.46	11.5	5.9
12 Apr	102	4.94	2.0	2.6
19 Apr	109	4.94	2.0	0.7
26 Apr	116	5.04	0.0	0.0
3 May	123	4.55	9.7	1.0
1971	*Blenda*	Craibstone		
8 Mar	67	4.58	15.8	16.5
15 Mar	74	4.58	15.8	10.5
22 Mar	81	4.38	19.5	5.9
29 Mar	88	4.97	8.6	2.6
5 Apr	95	5.39	0.9	0.7
12 Apr	102	5.44	0.0	0.0
19 Apr	109	3.85	29.2	1.0
26 Apr	116	3.60	33.8	3.8
3 May	123	2.77	49.1	8.6
1972	*Blenda*	Craibstone		
1 Mar	61	4.58	6.3	0.7
8 Mar	68	4.89	0.0	0.0
15 Mar	75	4.58	6.3	1.0
22 Mar	82	4.02	17.8	3.8
29 Mar	89	4.19	14.3	8.6
5 Apr	96	3.89	20.4	15.2
12 Apr	103	3.89	20.4	23.8
19 Apr	110	3.02	38.2	34.2
26 Apr	117	2.86	41.5	46.6
3 May	124	1.85	62.2	60.9
1953	*Forward*	Craibstone		
1 Mar	60	3.51	4.9	5.9
8 Mar	67	3.54	4.1	2.6
15 Mar	74	3.42	7.3	0.7
22 Mar	81	3.69	0.0	0.0
29 Mar	88	3.15	14.6	1.0
5 Apr	95	2.22	39.8	3.8
12 Apr	102	2.49	32.5	8.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1954	*Forward*	Craibstone		
8 Mar	67	3.39	4.5	5.9
15 Mar	74	3.47	2.3	2.6
22 Mar	81	3.53	0.6	0.7
29 Mar	88	3.55	0.0	0.0
5 Apr	95	3.39	4.5	1.0
12 Apr	102	3.42	3.7	3.8
19 Apr	109	3.27	7.9	8.6
26 Apr	116	2.77	22.0	15.2
3 May	123	2.16	39.2	23.8
1955	*Forward*	Craibstone		
8 Mar	67	4.25	1.8	10.5
15 Mar	74	4.02	7.2	5.9
22 Mar	81	4.31	0.5	2.6
29 Mar	88	3.78	12.7	0.7
5 Apr	95	4.33	0.0	0.0
12 Apr	102	3.64	15.9	1.0
19 Apr	109	3.35	22.6	3.8
26 Apr	116	3.18	26.6	8.6
3 May	123	3.07	29.1	15.2
1956	*Forward*	Craibstone		
1 Mar	61	5.00	8.9	5.9
8 Mar	68	5.00	8.9	2.6
15 Mar	75	3.36	38.8	0.7
22 Mar	82	5.49	0.0	0.0
29 Mar	89	4.81	12.4	1.0
5 Apr	96	4.80	12.6	3.8
12 Apr	103	4.48	18.4	8.6
19 Apr	110	4.60	16.2	15.2
26 Apr	117	3.32	29.5	23.8
3 May	124	1.84	66.5	34.6
1957	*Forward*	Craibstone		
1 Mar	60	2.45	12.5	23.7
8 Mar	67	2.03	27.5	16.5
15 Mar	74	1.70	39.3	10.5
22 Mar	81	1.90	32.1	5.9
29 Mar	88	1.89	32.5	2.6
5 Apr	95	2.46	12.1	0.7
12 Apr	102	2.80	0.0	0.0
19 Apr	109	2.24	20.0	1.0
26 Apr	116	1.41	49.6	3.8
3 May	123	0.74	73.6	8.6
1958	*Forward*	Craibstone		
1 Mar	60	4.04	12.2	16.5
15 Mar	74	3.82	17.0	5.9
22 Mar	81	4.03	12.4	2.6
29 Mar	88	4.33	5.9	0.7
5 Apr	95	4.60	0.0	0.0
12 Apr	102	4.31	6.3	1.0
19 Apr	109	4.10	10.9	3.8
26 Apr	116	3.90	15.2	8.6
3 May	123	1.80	60.9	15.2
1959	*Forward*	Craibstone		
1 Mar	60	6.14	7.9	10.5
8 Mar	67	5.84	12.3	5.9
15 Mar	74	6.18	7.3	2.6
22 Mar	81	6.22	6.7	0.7
29 Mar	88	6.67	0.0	0.0
5 Apr	95	5.33	20.1	1.0
12 Apr	102	5.42	18.7	3.8
19 Apr	109	4.59	31.2	8.6
26 Apr	116	4.09	38.2	15.2
3 May	123	3.53	47.1	23.8

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1960	*Forward*	Craibstone		
1 Mar	61	5.21	11.7	0.7
8 Mar	68	5.90	0.0	0.0
15 Mar	75	5.56	5.8	1.0
22 Mar	82	4.49	23.9	3.8
29 Mar	89	5.65	4.2	8.6
5 Apr	96	5.45	7.6	15.2
12 Apr	103	3.80	35.6	23.6
19 Apr	110	2.94	50.2	34.2
26 Apr	117	1.79	69.7	46.6
3 May	124	0.59	89.9	60.9
1961	*Forward*	Craibstone		
1 Mar	60	4.66	0.0	0.0
8 Mar	67	4.14	11.2	1.0
15 Mar	74	3.40	27.0	3.8
22 Mar	81	3.58	23.2	8.6
29 Mar	87	3.09	33.7	15.2
5 Apr	95	2.86	38.6	23.8
12 Apr	102	2.72	41.6	34.2
19 Apr	109	2.90	37.7	46.6
26 Apr	116	0.92	80.3	60.9
3 May	123	0.46	90.1	77.0
1962	*Forward*	Craibstone		
1 Mar	60	3.30	31.2	15.6
22 Mar	81	4.55	5.2	2.6
29 Mar	88	4.09	14.8	0.7
5 Apr	95	4.80	0.0	0.0
12 Apr	102	2.47	48.5	1.0
19 Apr	109	3.15	34.4	3.8
26 Apr	116	3.20	33.3	8.6
3 May	123	2.89	39.8	15.2
1963	*Forward*	Craibstone		
8 Mar	67	4.23	13.3	0.7
15 Mar	74	4.88	0.0	0.0
22 Mar	81	4.75	2.7	1.0
29 Mar	88	4.18	14.3	3.8
5 Apr	95	4.29	12.1	8.6
12 Apr	102	3.85	21.1	15.2
19 Apr	109	3.93	19.5	23.8
26 Apr	116	3.32	32.0	34.2
3 May	123	2.12	56.6	46.6
1964	*Forward*	Craibstone		
1 Mar	61	6.93	0.0	0.0
8 Mar	68	6.59	4.9	1.0
22 Mar	82	6.72	3.0	8.6
29 Mar	89	6.13	11.5	15.2
5 Apr	96	5.74	17.2	23.8
12 Apr	103	5.69	17.9	34.2
19 Apr	110	4.77	31.2	46.6
26 Apr	117	4.41	36.4	60.9
3 May	124	2.03	70.7	77.0
1965	*Forward*	Craibstone		
15 Mar	74	2.60	24.6	23.7
22 Mar	81	2.99	13.3	16.5
29 Mar	88	2.93	15.1	10.5
5 Apr	95	2.67	22.6	5.9
12 Apr	102	3.10	10.1	2.6
19 Apr	109	3.38	2.0	0.7
26 Apr	116	3.45	0.0	0.0
3 May	123	3.15	8.7	1.0
1966	*Forward*	Craibstone		
8 Mar	67	5.52	0.0	0.0
15 Mar	74	5.22	5.4	1.0
22 Mar	81	5.15	6.7	3.8
29 Mar	88	4.15	24.8	8.6
5 Apr	95	4.24	23.2	15.2
12 Apr	102	3.85	30.3	23.8
19 Apr	109	4.07	26.3	34.2
26 Apr	116	5.03	8.9	46.6
3 May	123	4.48	18.8	60.9

ANNEX 5 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1967	*Forward*	Craibstone		
1 Mar	60	4.66	22.3	16.3
8 Mar	67	5.38	10.3	10.5
15 Mar	74	5.24	12.7	5.9
22 Mar	81	5.96	0.7	2.6
29 Mar	88	5.60	6.7	0.7
5 Apr	95	6.00	0.0	0.0
12 Apr	102	5.03	16.2	1.0
19 Apr	109	5.36	10.7	3.8
26 Apr	116	5.18	13.7	8.6
3 May	123	5.30	11.7	15.2
1968	*Forward*	Craibstone		
1 Mar	61	3.13	0.0	0.0
8 Mar	68	2.75	12.1	1.0
15 Mar	75	2.76	11.8	3.8
22 Mar	82	2.31	26.2	8.6
29 Mar	89	2.04	34.8	15.2
12 Apr	103	1.20	61.7	34.2
19 Apr	110	1.31	58.1	46.6
26 Apr	117	1.44	54.0	60.9
3 May	124	1.61	48.6	77.0
1969	*Forward*	Craibstone		
8 Mar	67	3.46	23.8	41.2
22 Mar	81	2.98	34.4	27.7
29 Mar	88	3.43	24.4	16.5
5 Apr	95	3.23	28.9	10.5
12 Apr	102	3.34	26.4	5.9
19 Apr	109	3.78	16.7	2.6
26 Apr	116	3.98	12.3	0.7
3 May	123	4.54	0.0	0.0
1970	*Forward*	Craibstone		
15 Mar	74	4.75	0.0	0.0
22 Mar	81	4.59	3.4	1.0
29 Mar	88	4.10	13.8	3.8
5 Apr	95	4.55	4.2	8.6
12 Apr	102	4.50	5.3	15.2
19 Apr	109	4.51	5.1	23.8
26 Apr	116	4.29	9.7	34.2
3 May	123	1.31	72.4	46.6
1971	*Forward*	Craibstone		
8 Mar	67	4.41	24.6	10.5
15 Mar	74	3.85	34.2	5.9
22 Mar	81	4.61	21.2	2.6
29 Mar	88	5.80	0.9	0.7
5 Apr	95	5.85	0.0	0.0
12 Apr	102	4.95	15.4	1.0
19 Apr	109	4.38	25.1	3.8
26 Apr	116	4.33	26.0	8.6
3 May	123	3.50	40.2	15.2
1973	*Karim*	Craibstone		
8 Mar	67	3.90	26.0	23.7
15 Mar	74	3.79	28.1	16.5
22 Mar	81	3.90	26.0	10.5
29 Mar	88	4.65	11.8	5.9
5 Apr	95	4.39	16.7	2.6
12 Apr	102	4.12	21.8	0.7
19 Apr	109	5.27	0.0	0.0
26 Apr	116	4.20	20.3	1.0
3 May	123	2.47	53.1	3.8
1974	*Karim*	Craibstone		
8 Mar	67	5.90	0.0	0.0
22 Mar	81	5.39	8.6	3.8
29 Mar	88	5.60	5.1	8.6
5 Apr	95	5.44	7.8	15.2
12 Apr	102	5.00	15.3	23.8
19 Apr	109	4.45	24.6	34.2
26 Apr	116	4.42	25.1	46.6
3 May	123	2.67	54.7	60.9

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1975	*Karim*	Craibstone		
1 Mar	60	4.28	9.3	2.6
8 Mar	67	4.63	1.9	0.7
15 Mar	74	4.72	0.0	0.0
22 Mar	81	4.18	11.4	1.0
29 Mar	88	4.12	12.7	3.8
5 Apr	95	4.12	12.7	8.6
19 Apr	109	4.02	14.8	23.8
26 Apr	116	3.60	23.7	34.2
3 May	123	2.52	46.6	44.6
1976	*Karim*	Craibstone		
1 Mar	61	3.64	13.5	0.7
8 Mar	68	4.21	0.0	0.0
15 Mar	75	4.09	2.9	1.0
22 Mar	82	3.89	7.6	3.8
29 Mar	89	3.78	10.2	8.6
5 Apr	96	3.71	11.9	15.2
12 Apr	103	3.99	5.2	23.8
19 Apr	110	3.37	20.0	34.2
26 Apr	117	2.64	37.3	46.6
3 May	124	1.72	59.1	60.9
1977	*Karim*	Craibstone		
8 Mar	67	5.88	0.0	0.0
15 Mar	74	5.21	11.4	1.0
22 Mar	81	5.19	11.8	3.8
29 Mar	88	4.43	24.7	8.6
5 Apr	95	4.30	26.9	15.2
12 Apr	102	4.08	30.6	23.8
19 Apr	109	4.10	30.3	34.2
26 Apr	116	3.35	43.0	46.6
3 May	123	2.97	49.5	60.9
1978	*Karim*	Craibstone		
1 Mar	60	5.41	13.2	5.9
8 Mar	67	4.78	23.3	2.6
15 Mar	74	4.84	22.3	0.7
22 Mar	81	6.23	0.0	0.0
29 Mar	88	4.86	22.0	1.0
5 Apr	95	4.62	25.8	3.8
12 Apr	102	4.87	21.8	8.6
19 Apr	109	4.37	29.9	15.2
26 Apr	116	3.21	48.5	23.8
3 May	123	2.37	62.0	34.2
1978	*M. Tabard*	Craibstone		
1 Mar	60	5.08	0.0	0.0
8 Mar	67	4.94	2.8	1.0
15 Mar	74	5.03	1.0	3.8
22 Mar	81	4.51	11.2	8.6
29 Mar	88	4.07	19.9	15.2
5 Apr	95	4.02	20.9	23.8
12 Apr	102	4.10	19.3	34.2
19 Apr	109	3.49	31.3	46.6
26 Apr	116	2.49	51.0	60.9
3 May	123	2.30	54.7	77.0
1979	*M. Tabard*	Craibstone		
12 Apr	102	5.08	4.2	0.7
19 Apr	109	5.30	0.0	0.0
26 Apr	116	5.20	1.9	1.0
3 May	123	4.48	15.5	3.8
1980	*M. Tabard*	Craibstone		
1 Mar	61	4.07	8.9	16.5
8 Mar	68	3.15	29.5	10.5
15 Mar	75	3.81	14.8	5.9
29 Mar	89	3.87	13.4	0.7
5 Apr	96	4.47	0.0	0.0
12 Apr	103	4.30	3.8	1.0
19 Apr	110	4.19	6.3	3.8
26 Apr	117	3.21	28.2	8.6
3 May	124	1.42	68.2	15.2

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1981	*M. Tabard*	Craibstone		
1 Mar	60	6.89	2.8	5.9
8 Mar	67	6.68	5.8	2.6
15 Mar	74	6.77	4.5	0.7
22 Mar	81	7.09	0.0	0.0
29 Mar	88	4.86	31.5	1.0
5 Apr	95	5.90	16.8	3.8
12 Apr	102	5.83	17.8	8.6
19 Apr	109	5.38	24.1	15.2
16 Apr	116	4.74	33.1	23.8
3 May	123	4.10	42.2	34.2
1982	*M.Tabard*	Craibstone		
1 Mar	60	6.28	0.0	0.0
8 Mar	67	5.47	12.9	1.0
15 Mar	74	5.34	15.0	3.8
22 Mar	81	5.15	18.0	8.6
29 Mar	88	5.23	16.7	15.2
5 Apr	95	4.73	24.7	23.8
12 Apr	102	4.04	35.7	34.6
19 Apr	109	3.86	38.5	46.6
26 Apr	116	3.56	43.3	60.9
3 May	123	2.56	59.2	77.0
1983	*M. Tabard*	Craibstone		
1 Mar	60	5.85	5.8	16.5
8 Mar	67	4.80	22.7	10.5
15 Mar	74	5.04	18.8	5.9
22 Mar	81	5.33	14.2	2.6
29 Mar	88	6.07	2.3	0.7
5 Apr	95	6.21	0.0	0.0
12 Apr	102	5.88	5.3	1.0
19 Apr	109	5.61	9.7	3.8
26 Apr	116	4.99	19.6	8.6
3 May	123	4.98	19.8	15.2
1979	*Trafalgar*	Craibstone		
12 Apr	102	5.50	0.0	0.0
19 Apr	109	5.36	2.6	1.0
26 Apr	116	4.14	24.7	3.8
3 May	123	4.57	16.9	8.6
1980	*Trafalgar*	Craibstone		
1 Mar	61	3.73	18.9	23.7
8 Mar	68	3.77	18.0	16.5
15 Mar	75	4.13	10.2	10.5
29 Mar	89	3.86	16.1	2.6
5 Apr	96	4.43	3.7	0.7
12 Apr	103	4.60	0.0	0.0
19 Apr	110	4.14	10.0	1.0
26 Apr	117	3.53	23.3	3.8
3 May	124	2.18	52.6	8.6
1981	*Trafalgar*	Craibstone		
1 Mar	60	6.63	0.0	0.0
8 Mar	67	6.40	3.5	1.0
15 Mar	74	6.24	5.9	3.8
22 Mar	81	6.46	2.6	8.6
29 Mar	88	6.28	5.3	15.2
5 Apr	95	6.07	8.4	23.8
12 Apr	102	5.84	11.9	34.2
19 Apr	109	5.50	17.0	46.6
22 Apr	116	4.74	28.5	60.9
3 May	123	3.62	45.4	77.0
1982	*Trafalgar*	Craibstone		
1 Mar	60	5.45	8.1	2.6
8 Mar	67	5.22	12.0	0.7
15 Mar	74	5.93	0.0	0.0
22 Mar	81	5.46	7.9	1.0
29 Mar	88	5.40	8.9	3.8
5 Apr	95	4.87	17.9	8.6
12 Apr	102	4.29	27.8	15.2
19 Apr	109	4.11	30.8	23.8
26 Apr	116	3.37	43.3	34.2
3 May	123	1.30	78.1	46.6

ANNEX 5 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp	Calc.
1983	*Trafalgar*	Craibstone		
1 Mar	60	5.37	6.1	16.5
8 Mar	67	5.37	6.1	10.5
15 Mar	74	4.75	17.0	5.9
22 Mar	81	5.27	7.9	2.6
29 Mar	88	5.44	4.9	0.7
5 Apr	95	5.72	0.0	0.0
19 Apr	109	5.22	8.7	3.8
26 Apr	116	5.29	7.5	8.6
3 May	123	5.00	12.6	15.2
1953	*Victory*	Craibstone		
1 Mar	60	3.44	0.0	0.0
8 Mar	67	2.76	19.8	1.0
15 Mar	74	3.00	12.8	3.8
22 Mar	81	1.99	42.2	8.6
29 Mar	88	2.59	24.2	15.2
5 Apr	95	1.39	59.6	23.8
12 Apr	102	2.02	41.3	34.2
19 Apr	109	1.62	52.9	46.6
1954	*Victory*	Craibstone		
8 Mar	67	2.78	0.0	0:0
15 Mar	74	2.77	0.4	1.0
22 Mar	81	2.77	0.4	3.8
29 Mar	88	2.56	7.9	8.6
5 Apr	95	2.59	6.8	15.2
12 Apr	102	2.47	11.2	23.8
19 Apr	109	1.92	30.9	34.2
26 Apr	116	1.78	36.0	46.6
3 May	123	1.07	61.5	60.9
1955	*Victory*	Craibstone		
8 Mar	67	4.31	0.0	0.0
15 Mar	74	3.85	10.7	1.0
22 Mar	81	3.64	15.5	3.8
29 Mar	88	4.17	3.2	8.6
5 Apr	95	3.90	9.5	15.2
12 Apr	102	3.37	21.8	23.8
19 Apr	109	2.85	33.9	34.2
26 Apr	116	2.28	47.1	46.6
3 May	123	2.70	37.4	60.9
1956	*Victory*	Craibstone		
1 Mar	61	4.97	5.5	2.6
8 Mar	68	5.06	3.8	0.7
15 Mar	75	5.26	0.0	0.0
22 Mar	82	4.83	8.2	1.0
29 Mar	89	4.63	12.0	3.8
5 Apr	96	4.65	11.6	8.6
12 Apr	103	4.86	7.6	15.2
19 Apr	110	4.33	17.7	23.8
26 Apr	117	2.82	46.4	34.2
3 May	124	1.03	80.4	46.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1957	*Victory*	Craibstone		
1 Mar	60	2.35	0.0	0.0
8 Mar	67	1.98	15.7	1.0
15 Mar	74	1.85	21.3	3.8
22 Mar	81	1.49	36.6	8.6
29 Mar	88	2.15	8.5	15.2
5 Apr	95	2.30	2.1	23.8
12 Apr	102	2.06	12.3	34.2
19 Apr	109	2.13	9.4	46.6
26 Apr	116	1.20	48.9	60.9
3 May	123	0.75	68.1	77.0
1958	*Victory*	Craibstone		
1 Mar	60	3.42	11.6	16.5
15 Mar	74	3.22	16.8	6.5
22 Mar	81	3.56	8.0	2.6
29 Mar	88	3.73	3.6	0.7
5 Apr	95	3.87	0.0	0.0
12 Apr	102	3.19	17.6	1.0
19 Apr	109	3.25	16.0	3.8
26 Apr	116	2.73	29.5	8.6
3 May	123	2.52	34.9	15.2
1959	*Victory*	Craibstone		
1 Mar	60	5.27	0.9	10.5
8 Mar	67	4.86	8.6	5.9
15 Mar	74	5.11	3.9	2.6
22 Mar	81	5.30	0.4	0.7
29 Mar	88	5.32	0.0	0.0
5 Apr	95	4.58	13.9	1.0
12 Apr	102	4.28	19.5	3.8
19 Apr	109	3.40	36.1	8.6
26 Apr	116	3.24	39.1	15.2
3 May	123	2.52	52.6	23.8
1960	*Victory*	Craibstone		
1 Mar	61	4.26	27.8	5.9
8 Mar	68	5.48	7.1	2.6
15 Mar	75	5.24	11.2	0.7
22 Mar	82	5.90	0.0	0.0
29 Mar	89	5.61	4.9	1.0
5 Apr	96	4.59	22.2	3.8
12 Apr	103	4.12	30.2	8.6
19 Apr	110	2.91	50.7	15.2
26 Apr	117	1.57	73.4	23.8
3 May	124	0.32	94.6	34.2
1961	*Victory*	Craibstone		
1 Mar	60	3.78	0.0	0.0
8 Mar	67	3.59	5.0	0.9
15 Mar	74	2.90	23.3	3.8
22 Mar	81	3.49	7.7	8.6
29 Mar	88	2.56	32.3	15.2
5 Apr	95	3.00	20.6	23.8
12 Apr	102	2.83	25.1	34.2
19 Apr	109	1.53	59.5	46.6
26 Apr	116	0.49	87.0	60.9
3 May	123	0.20	94.7	77.0

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1962	*Victory*	Craibstone		
1 Mar	60	3.99	0.0	0.0
22 Mar	81	3.89	2.5	8.6
29 Mar	88	3.82	4.3	15.2
5 Apr	95	3.58	10.3	23.8
12 Apr	102	3.64	8.8	34.2
19 Apr	109	2.50	37.3	46.6
26 Apr	116	3.32	16.8	60.9
3 May	123	1.03	74.2	77.0
1963	*Victory*	Craibstone		
8 Mar	67	1.93	51.1	5.9
15 Mar	74	3.03	23.3	2.6
22 Mar	81	2.27	42.5	0.7
29 Mar	88	3.95	0.0	0.0
5 Apr	95	2.76	30.1	1.0
12 Apr	102	1.82	53.9	3.8
19 Apr	109	1.81	54.2	8.6
26 Apr	116	1.91	51.6	15.2
3 May	123	1.10	72.2	23.8
1964	*Victory*	Craibstone		
1 Mar	61	5.83	11.8	0.7
8 Mar	68	6.61	0.0	0.0
22 Mar	82	5.98	9.5	3.8
29 Mar	89	5.77	12.7	8.6
5 Apr	96	5.63	14.8	15.2
12 Apr	103	4.75	28.1	23.8
19 Apr	110	3.38	48.9	34.2
26 Apr	117	3.11	53.0	46.6
3 May	124	2.30	65.2	60.9
1965	*Victory*	Craibstone		
15 Mar	74	2.36	20.5	5.9
22 Mar	81	2.45	17.5	2.6
29 Mar	88	2.25	24.2	0.7
5 Apr	95	2.97	0.0	0.0
12 Apr	102	2.85	4.0	1.0
19 Apr	109	2.46	17.2	3.8
26 Apr	116	1.97	33.7	8.6
3 May	123	1.70	42.8	15.2
1966	*Victory*	Craibstone		
8 Mar	67	4.68	0.0	0.0
15 Mar	74	4.12	12.0	1.0
22 Mar	81	4.54	3.0	3.8
29 Mar	88	3.32	29.1	8.6
5 Apr	95	3.09	34.0	15.2
12 Apr	102	2.78	40.6	23.8
19 Apr	109	3.20	31.6	34.2
26 Apr	116	3.21	31.4	46.6
3 May	123	1.58	66.2	60.9

ANNEX 6 Potatoes: percentage yield losses from untimely establishment.

1950	*Arran Pilot*		Craibstone	
16 Mar	75	47.57	13.1	5.6
1 Apr	91	44.22	19.2	1.3
16 Apr	106	54.75	0.0	0.0
1 May	121	40.86	25.4	2.1
16 May	136	46.23	15.7	8.2
1 Jun	152	41.50	24.2	19.3

1951	*Arran Pilot*		Craibstone	
16 Mar	75	50.40	0.0	0.0
1 Apr	91	49.40	2.0	2.3
16 Apr	106	34.45	31.6	8.7
1 May	121	21.02	58.3	19.3
16 May	136	45.50	9.7	34.0
1 Jun	152	33.15	34.2	54.1

1952	*Arran Pilot*		Craibstone	
16 Mar	76	42.90	14.2	5.6
1 Apr	92	44.20	11.7	1.3
16 Apr	107	50.05	0.0	0.0
1 May	122	44.85	10.4	2.1
16 May	137	39.65	20.8	8.2
1 Jun	153	20.80	58.4	19.3

ANNEX 6 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp	Calc
1953	*Arran Pilot*		Craibstone	
16 Mar	75	33.15	13.6	21.6
1 Apr	91	33.80	11.9	11.8
16 Apr	106	37.70	1.7	5.2
1 May	121	37.05	3.4	1.3
16 May	136	38.35	0.0	0.0
1 Jun	152	19.50	49.2	2.3
1954	*Arran pilot*		Craibstone	
16 Mar	75	34.13	15.3	1.5
1 Apr	91	40.30	0.0	0.0
16 Apr	106	34.45	14.5	2.1
1 May	121	36.40	9.7	8.2
16 May	136	26.65	33.9	18.5
1 Jun	152	26.65	33.9	33.9
1955	*Arran Pilot*		Craibstone	
16 Mar	75	20.80	15.8	1.5
1 Apr	91	24.70	0.0	0.0
16 Apr	106	20.15	18.4	2.1
1 May	121	22.75	7.9	8.2
16 May	136	20.80	15.8	18.5
1 Jun	152	19.50	21.1	34.0
1956	Arran Pilot		Craibstone	
16 Mar	76	45.50	5.4	22.6
1 Apr	92	43.55	9.5	11.8
16 Apr	107	47.45	1.4	5.2
1 May	122	39.00	18.9	1.3
16 May	137	48.10	0.0	0.0
1 Jun	153	36.40	24.3	2.3
1957	*Arran Pilot*		Craibstone	
16 Mar	75	31.20	4.0	5.6
1 Apr	91	31.85	2.0	1.3
16 Apr	106	32.50	0.0	0.0
1 May	121	30.23	7.0	2.1
16 May	136	25.35	22.0	8.2
1 Jun	152	15.60	52.0	19.3
1958	*Arran Pilot*		Craibstone	
1 Apr	91	29.90	13.2	1.3
16 Apr	106	34.45	0.0	0.0
1 May	121	28.93	16.0	2.1
16 May	136	20.48	40.6	8.2
16 Jun	152	9.10	73.6	19.3
1959	*Arran Pilot*		Craibstone	
16 Mar	75	25.68	31.2	5.6
1 Apr	91	35.75	4.3	1.3
16 Apr	106	37.38	0.0	0.0
1 May	121	35.75	4.3	2.1
16 May	136	29.58	20.8	8.2
1 Jun	152	20.15	46.1	19.3
1961	*Arran Pilot*		Craibstone	
16 Mar	75	35.75	29.5	12.3
1 Apr	91	43.55	14.1	5.2
16 Apr	106	47.45	6.4	1.3
1 May	121	50.70	0.0	0.0
16 May	136	42.90	15.4	2.1
1 Jun	152	37.90	25.2	8.8
1962	*Arran Pilot*		Craibstone	
1 Apr	91	35.75	1.8	11.8
16 Apr	106	35.10	3.6	5.2
1 May	121	34.45	5.4	1.3
16 May	136	36.40	0.0	0.0
1 Jun	152	24.38	33.0	2.3

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1963	*Arran Pilot*		Craibstone	
16 Mar	75	36.40	9.7	1.5
1 Apr	91	40.30	0.0	0.0
16 Apr	106	34.45	14.5	2.1
1 May	121	28.93	28.2	8.2
16 May	136	29.90	25.8	18.5
1 Jun	152	19.83	50.8	34.0
1964	*Arran Pilot*		Craibstone	
16 Mar	76	26.98	5.7	34.5
1 Apr	92	23.73	17.0	21.6
16 Apr	107	24.38	14.8	12.3
1 May	122	25.35	11.4	5.6
16 May	137	28.28	1.1	1.5
1 Jun	153	28.60	0.0	0.0
1965	*Arran Pilot*		Craibstone	
16 Mar	75	46.15	13.4	1.5
1 Apr	91	53.30	0.0	0.0
16 Apr	106	41.60	21.9	2.1
1 May	121	39.00	26.8	8.2
16 May	136	42.58	20.1	18.8
1 Jun	152	31.85	40.2	34.0
1966	*Arran Pilot*		Craibstone	
16 Mar	75	51.03	0.0	0.0
1 Apr	91	40.78	20.1	2.3
16 Apr	106	47.43	7.1	8.8
1 May	121	37.35	26.8	20.2
16 May	136	33.95	33.5	34.0
1 Jun	152	28.58	49.0	54.1
1967	*Arran Pilot*		Craibstone	
16 Mar	75	30.70	10.9	5.6
1 Apr	91	23.55	31.6	1.3
16 Apr	106	34.45	0.0	0.0
1 May	121	28.43	17.5	2.3
16 May	136	33.30	3.3	8.2
1 Jun	152	28.75	16.5	19.3
1968	*Arran Pilot*		Craibstone	
16 Mar	75	23.73	25.4	21.6
1 Apr	92	31.35	1.6	11.8
16 Apr	107	28.25	11.3	5.2
1 May	122	26.95	15.4	1.3
16 May	137	31.83	0.0	0.0
1 Jun	153	29.25	8.2	2.3
1969	*Arran Pilot*		Craibstone	
16 Mar	75	28.73	31.4	34.5
1 Apr	91	32.15	23.3	21.6
16 Apr	106	29.15	30.4	12.3
1 May	121	32.00	23.6	5.6
16 May	136	40.63	3.0	1.5
1 Jun	152	41.90	0.0	0.0
1970	*Arran Pilot*		Craibstone	
16 Mar	75	23.98	27.2	12.3
1 Apr	91	32.45	1.5	5.2
16 Apr	106	29.80	9.6	1.3
1 May	121	32.95	0.0	0.0
16 May	136	31.65	3.9	2.1
1 Jun	152	29.21	11.4	8.8
1970	*Arran Pilot*		Craibstone	
16 Mar	75	36.90	2.6	5.6
1 Apr	91	37.46	1.2	1.3
16 Apr	106	37.90	0.0	0.0
1 May	121	35.70	5.8	2.1
16 May	136	35.10	7.4	8.2
1 Jun	152	27.90	26.4	19.3

Sowing day, Date	No.	Yield, t/ha	Yield loss, Exp.	Calc.
1971	*Arran Pilot*		Craibstone	
16 Mar	75	25.60	47.0	5.6
1 Apr	91	43.93	9.0	1.3
16 Apr	106	48.27	0.0	0.0
1 May	121	46.16	4.4	2.1
16 May	136	39.26	18.7	8.2
1 Jun	152	33.92	29.7	19.3
1972	*Arran Pilot*		Craibstone	
16 Mar	76	31.51	16.9	5.6
1 Apr	92	31.93	15.9	1.3
16 Apr	107	37.95	0.0	0.0
1 May	122	32.77	13.6	2.1
16 May	137	33.90	10.7	8.2
1 Jun	153	30.95	18.4	19.3
1973	*Arran Pilot*		Craibstone	
16 Mar	75	24.30	30.2	5.6
1 Apr	91	28.22	18.9	1.3
16 Apr	106	34.80	0.0	0.0
1 May	121	31.65	9.1	2.1
16 May	136	33.62	3.4	8.2
1 Jun	152	29.10	16.4	19.3
1974	*Arran Pilot*		Craibstone	
16 Mar	75	54.90	20.5	1.5
1 Apr	91	69.05	0.0	0.0
16 Apr	106	50.42	27.0	2.1
1 May	121	48.46	29.8	8.2
16 May	136	41.74	39.6	18.5
1 Jun	152	31.65	54.2	34.0
1975	*Arran Pilot*		Craibstone	
16 Mar	75	46.07	0.0	0.0
1 Apr	91	43.56	5.4	2.3
18 Apr	106	42.72	7.3	8.8
1 May	121	39.22	14.9	19.3
16 May	136	32.35	29.8	34.0
1 Jun	152	23.11	49.8	54.1
1976	*Arran Pilot*		Craibstone	
16 Mar	76	27.03	0.0	0.0
1 Apr	92	24.09	10.9	2.3
16 Apr	107	25.77	4.7	8.8
1 May	122	23.95	11.4	19.3
16 May	137	23.95	11.4	34.0
1 Jun	153	26.33	2.6	52.7
1977	*Arran Pilot*		Craibstone	
16 Mar	75	44.52	0.0	0.0
1 Apr	91	40.32	9.4	2.3
16 Apr	106	39.48	11.3	8.8
1 May	121	33.74	24.2	19.3
16 May	136	32.90	26.1	34.0
1 Jun	152	30.38	31.8	54.1
1980	*Cara*	Ar. Rickwood		
14 Apr	105	53.90	0.0	0.0
24 Apr	115	50.60	6.1	0.9
7 May	128	48.70	9.6	4.8
1979	*Desiree*	H. Mowthorpe		
21 Apr	111	33.40	0.0	0.0
14 May	134	32.70	2.1	4.8
24 May	144	25.30	24.3	9.9
1950	*Majestic*		Craibstone	
16 Mar	75	43.18	0.7	1.5
1 Apr	91	43.50	0.0	0.0
16 Apr	106	42.15	3.1	2.1
1 May	121	34.70	20.2	8 2
16 May	136	41.35	4.9	18.5
1 Jun	152	25.48	41.4	34.0

ANNEX 6 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1951	*Majestic*	Craibstone		
16 Mar	75	47.45	3.9	21.6
1 Apr	91	46.15	6.6	11.8
16 Apr	106	39.05	21.0	5.2
1 May	121	44.20	10.5	1.3
16 May	136	49.40	0.0	0.0
1 Jun	152	31.20	36.8	2.3
1952	*Majestic*	Craibstone		
16 Mar	76	44.85	5.5	1.5
1 Apr	92	47.45	0.0	0.0
16 Apr	107	43.55	8.2	2.1
1 May	122	44.20	6.8	8.2
16 May	137	33.80	28.8	18.5
1 Jun	153	27.30	42.5	34.0
1953	*Majestic*	Craibstone		
16 Mar	75	33.80	7.2	1.5
1 Apr	91	36.40	0.0	0.0
16 Apr	106	32.50	10.7	2.1
16 May	136	32.60	10.4	18.2
1 Jun	152	24.05	33.9	34.0
1954	*Majestic*	Craibstone		
16 Mar	75	34.45	18.5	1.5
1 Apr	91	42.25	0.0	0.0
16 Apr	106	34.78	17.7	2.1
1 May	121	32.50	23.1	8.2
16 May	136	32.50	23.1	18.5
1 Jun	152	17.55	58.5	34.0
1955	*Majestic*	Craibstone		
16 Mar	75	11.70	41.9	21.6
1 Apr	91	13.65	32.3	11.8
16 Apr	106	13.00	35.5	5.2
1 May	121	16.90	16.2	1.3
16 May	136	20.15	0.0	0.0
1 Jun	152	18.20	9.1	2.3
1956	*Majestic*	Craibstone		
16 Mar	76	46.80	10.6	5.6
1 Apr	92	51.35	5.9	1.3
16 Apr	107	54.60	0.0	0.0
1 May	122	40.95	25.0	2.1
16 May	137	39.00	28.6	8.2
1 Jun	153	33.15	39.3	19.3
1957	*Majestic*	Craibstone		
16 Mar	75	26.65	0.0	0.0
1 Apr	91	23.40	12.2	2.3
16 Apr	106	21.78	18.3	8.8
1 May	121	21.13	20.7	19.3
16 May	136	18.85	29.3	34.0
1 Jun	152	13.65	48.8	54.1
1958	*Majestic*	Craibstone		
1 Apr	91	31.53	13.4	1.3
16 Apr	106	36.40	0.0	0.0
1 May	121	31.53	13.4	2.1
16 May	136	29.90	17.9	8.2
1 Jun	152	13.65	62.5	19.3
1959	*Majestic*	Craibstone		
16 Mar	75	52.35	0.0	0.0
1 Apr	91	34.13	34.8	2.3
16 Apr	106	42.25	19.3	8.8
1 Apr	121	36.73	29.8	19.3
16 Apr	136	37.05	29.2	34.0
1 Jun	152	22.75	56.5	54.1
1960	*Majestic*	Craibstone		
16 Mar	76	55.90	0.0	0.0
1 Apr	92	50.70	9.3	2.3
16 Apr	107	44.20	20.9	8.8
1 May	122	44.20	20.9	19.3
16 May	137	27.30	51.2	34.0
1 Jun	153	34.13	38.9	54.1

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1961	*Majestic*	Craibstone		
1 Apr	91	46.80	0.0	0.0
16 Apr	106	44.53	5.1	2.1
1 May	121	40.63	13.2	8.2
16 May	136	33.15	29.2	18.5
1 Jun	152	30.55	34.7	34.0
1962	*Majestic*	Craibstone		
16 Mar	75	34.13	3.7	1.5
1 Apr	91	35.43	0.0	0.0
16 Apr	106	34.13	3.7	2.1
1 May	121	29.25	17.4	8.2
16 May	136	26.00	26.6	18.5
1 Jun	152	17.55	50.5	34.0
1964	*Majestic*	Craibstone		
16 Mar	76	32.18	23.3	12.3
1 Apr	92	40.63	3.1	5.2
16 Apr	107	38.35	8.5	1.3
1 May	122	41.93	0.0	0.0
16 May	137	38.68	7.8	2.1
1 Jun	153	38.63	7.9	8.8
1965	*Majestic*	Craibstone		
16 Mar	75	47.45	0.0	0.0
1 Apr	91	46.15	2.7	2.3
16 Apr	106	44.85	5.5	8.8
1 May	121	39.00	17.8	19.3
16 May	136	40.30	15.1	34.0
1 Jun	152	30.55	35.6	54.1
1966	*Majestic*	Craibstone		
16 Mar	75	40.60	0.4	1.5
1 Apr	91	40.78	0.0	0.0
16 Apr	106	39.48	3.2	2.1
1 May	121	38.98	4.4	8.2
16 May	136	29.08	28.7	18.5
1 Jun	152	27.45	32.7	34.0
1967	*Majestic*	Craibstone		
16 Mar	75	36.40	3.4	1.5
1 Apr	91	37.70	0.0	0.0
16 Apr	106	33.63	10.8	2.1
1 May	121	37.38	0.8	8.2
16 May	136	37.38	0.8	18.5
1 Jun	152	31.03	17.7	34.0
1968	*Majestic*	Craibstone		
16 Mar	76	20.48	36.3	1.5
1 Apr	92	32.15	0.0	0.0
16 Apr	107	31.83	1.0	2.1
1 May	122	28.75	10.6	8.2
16 May	137	30.53	5.0	18.5
1 Jun	153	30.38	5.5	34.0
1969	*Majestic*	Craibstone		
16 Mar	75	30.53	17.6	22.6
1 Apr	91	31.68	14.4	11.8
16 Apr	106	31.50	14.9	5.2
1 May	121	34.58	6.6	1.3
16 May	136	37.03	0.0	0.0
1 Jun	152	35.10	5.2	2.3
1970	*Majestic*	Craibstone		
16 Mar	75	21.05	43.9	5.6
1 Apr	91	31.10	17.2	1.3
16 Apr	106	37.57	0.0	0.0
1 May	121	30.21	19.6	2.1
16 May	136	30.69	18.3	8.2
1 Jun	152	30.14	19.8	19.3

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1970	*Majestic*	Craibstone		
16 Mar	75	36.20	6.0	1.5
1 Apr	91	38.50	0.0	0.0
16 Apr	106	36.70	4.7	2.1
1 May	121	34.90	9.4	8.2
16 May	136	33.70	12.5	18.5
1 Jun	152	27.10	29.6	34.0
1971	*Majestic*	Craibstone		
16 Mar	75	50.68	2.1	12.3
1 Apr	91	50.09	3.2	5.2
16 Apr	106	51.07	1.3	1.3
1 May	121	51.76	0.0	0.0
16 May	136	35.97	30.5	2.1
1 Jun	152	29.88	42.3	8.8
1972	*Majestic*	Craibstone		
16 Mar	76	46.16	15.8	12.3
1 Apr	92	54.03	1.4	5.2
16 Apr	107	53.71	2.0	1.3
1 May	122	54.80	0.0	0.0
16 May	137	40.90	25.4	2.1
1 June	153	36.45	33.5	8.8
1973	*Majestic*	Craibstone		
16 Mar	75	34.66	10.2	1.5
1 Apr	91	38.60	0.0	0.0
16 Apr	106	35.23	8.7	2.1
1 May	121	36.85	4.5	8.2
16 May	136	36.25	6.1	18.5
1 Jun	152	26.80	30.6	34.0
1974	*Majestic*	Craibstone		
16 Mar	75	47.76	6.6	5.6
1 Apr	91	49.86	2.5	1.3
16 Apr	106	51.12	0.0	0.0
1 May	121	39.49	22.8	2.1
16 May	136	34.73	32.1	8.2
1 Jun	152	23.95	53.2	19.3
1975	*Majestic*	Craibstone		
16 Mar	75	37.11	4.3	1.5
1 Apr	91	38.79	0.0	0.0
16 Apr	106	31.09	19.9	2.1
1 May	121	38.24	1.4	8.2
16 May	136	24.23	37.5	18.5
1 Jun	152	23.81	38.6	34.0
1978	*Maris Piper*	Craibstone		
16 Mar	75	59.94	0.0	0.0
1 Apr	91	53.64	10.5	2.3
16 Apr	106	57.84	3.5	8.8
1 May	121	53.94	10.0	19.3
16 May	136	46.92	21.7	34.0
1 Jun	152	28.29	52.8	54.1
1978	*Maris Piper*	Craibstone		
16 Mar	75	43.54	4.0	12.3
1 Apr	91	43.12	4.9	5.2
18 Apr	106	37.24	17.9	1.3
1 May	121	45.36	0.0	0.0
16 May	136	40.74	10.2	2.1
1 Jun	152	34.36	24.3	8.8
1980	*Maris Piper*	Craibstone		
16 Mar	76	51.32	5.7	1.5
1 Apr	92	54.41	0.0	0.0
16 Apr	107	50.47	7.2	2.1
1 May	122	45.13	17.1	8.2
16 May	137	28.68	47.3	18.5
1 Jun	153	16.59	69.5	34.0

ANNEX 6 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1982	*Maris Piper*		Craibstone	
16 Mar	75	43.87	7.2	34.5
1 Apr	91	35.15	25.6	21.6
16 Apr	106	35.30	25.3	12.3
1 May	121	46.54	1.5	5.6
16 May	136	46.86	0.8	1.5
1 Jun	152	47.25	0.0	0.0
1983	*Maris Piper*		Craibstone	
16 Mar	75	45.07	0.0	0.0
1 Apr	91	33.83	24.9	2.3
16 Apr	106	31.75	29.6	8.8
1 May	121	31.76	29.5	19.3
16 May	136	38.92	13.6	34.0
1 Jun	152	37.64	16.5	54.1
1971	*PCF King Edward*		Terrington	
5 Apr	95	41.69	4.1	0.7
16 Apr	106	43.49	0.0	0.0
3 May	123	37.21	14.4	6.7
1971	*PCF King Edward*		Terrington	
5 Apr	95	40.34	0.0	0.0
16 Apr	106	38.78	3.9	1.1
3 May	123	31.61	21.6	7.2

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1971	*PCF King Edward*		Terrington	
5 Apr	95	38.55	0.0	0.0
16 Apr	106	37.21	3.5	1.1
3 May	123	28.24	26.7	7.2
1978	*Pentland Javelin*		Craibstone	
16 Mar	75	47.95	0.0	0.0
1 Apr	91	43.13	10.1	2.3
16 Apr	106	45.06	6.0	8.8
1 May	121	40.75	15.6	19.3
16 May	136	37.25	22.3	34.0
1 Jun	152	29.97	37.5	54.1
1979	*Pentland Javelin*		Craibstone	
16 Mar	75	43.82	0.0	0.0
1 Apr	91	41.44	5.4	2.3
16 Apr	106	39.71	9.4	8.8
1 May	121	34.86	20.4	19.3
16 May	136	38.04	13.2	34.0
1 Jun	152	30.66	30.0	54.1
1979	*Pentland Javelin*		H. Mowthorpe	
21 Apr	111	36.00	0.0	0.0
14 May	134	32.50	9.7	4.7
24 May	144	24.40	31.9	9.9

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc
1980	*Pentland Javelin*		Craibstone	
16 Mar	76	39.03	6.5	1.5
1 Apr	92	41.75	0.0	0.0
16 Apr	107	38.94	6.7	2.1
1 May	122	35.00	16.2	8.8
16 May	137	23.20	44.4	19.3
1 Jun	153	20.39	51.2	34.0
1982	*Pentland Javelin*		Craibstone	
16 Mar	75	29.81	33.5	34.5
1 Apr	91	30.23	32.6	21.6
16 Apr	106	32.06	28.5	12.3
1 May	121	32.48	27.6	5.6
16 May	136	35.89	20.0	1.5
1 Jun	152	44.85	0.0	0.0
1982	*Pentland Javelin*		Craibstone	
16 Mar	75	33.03	9.2	34.5
1 Apr	91	25.35	30.3	21.6
16 Apr	106	32.01	12.0	12.3
1 May	121	32.78	9.8	5.2
16 May	136	29.45	19.0	1.5
1 Jun	152	36.36	0.0	0.0
1981	*Pentland Squire*		H. Mowthorpe	
17 Apr	107	30.20	4.7	3.6
12 May	132	31.70	0.0	0.0
19 May	139	30.20	4.7	0.4
5 Jun	156	27.50	13.2	5.3

ANNEX 7 Swedes: percentage yield losses from untimely establishment.

1975	*Doon Major*		Boghall	
20 Apr	110	4.68	0.0	0.0
3 May	123	4.01	14.3	3.1
17 May	137	3.73	20.3	13.4
30 May	150	3.55	24.1	29.5
14 Jun	165	3.60	23.1	51.8
1975	*Doon Major*		Cupar	
18 Apr	108	3.84	8.6	2.2
29 Apr	119	4.20	0.0	0.0
16 May	136	4.10	2.4	5.3
30 May	150	3.65	13.1	17.7
17 Jun	168	2.14	49.0	44.2
1975	*Doon Major*		Fife	
20 Apr	110	3.84	8.5	2.9
3 May	123	4.20	0.0	0.0
17 May	137	4.10	2.4	5.3
30 May	150	3.65	16.7	17.7
14 Jun	165	2.14	49.0	44.3
1976	*Doon Major*		Bush	
16 Apr	107	6.76	0.0	0.0
30 Apr	121	6.27	7.2	3.6
14 May	135	6.74	0.3	14.5
31 May	152	5.28	21.9	37.3
15 Jun	167	4.62	31.7	66.4
1976	*Doon Major*		Penicuik	
22 Apr	113	5.19	5.1	2.1
3 May	124	5.47	0.0	0.0
18 May	139	5.29	3.3	4.1
4 Jun	156	4.51	17.6	18.9
14 Jun	166	3.60	34.2	32.5
1977	*Doon Major*		Boghall	
20 Apr	110	3.71	7.3	12.6
17 May	137	4.00	0.0	0.0
30 May	150	3.51	12.3	3.1
14 Jun	165	3.23	19.3	14.5

1977	*Doon Major*		Bush	
15 Apr	105	3.71	7.3	16.5
16 May	136	4.00	0.0	0.0
30 May	150	3.51	12.2	3.6
15 June	166	3.23	19.3	16.6
1977	*Doon Major*		Kinross	
15 April	105	4.71	0.0	0.0
30 Apr	120	4.59	2.5	4.1
15 May	135	4.53	3.8	16.6
31 May	151	4.13	12.3	39.0
15 Jun	166	3.07	34.8	68.6
1977	*Doon Major*		Kinross	
20 Apr	110	4.06	6.2	12.6
3 May	123	3.34	22.9	3.8
17 May	137	4.33	0.0	0.0
30 May	150	4.20	3.0	3.1
14 Jun	165	4.13	4.6	14.4
1977	*Doon Major*		Mawcarse	
20 Apr	110	4.06	6.2	13.5
6 May	126	3.34	22.9	2.5
18 May	138	4.33	0.0	0.0
31 May	151	4.20	3.0	3.1
15 Jun	166	1.23	71.6	14.4
1975	*Fama Daehnfeldt*		Boghall	
20 Apr	110	6.52	0.0	0.0
3 May	123	5.80	11.0	3.1
17 May	137	5.38	17.5	13.4
30 May	150	5.29	18.9	29.5
14 Jun	165	4.34	33.4	55.7
1975	*Fama Daehnfeldt*		Elmwood ATC	
18 Apr	108	4.92	18.6	13.5
29 Apr	119	5.55	8.3	5.0
16 May	136	6.05	0.0	0.0
30 May	150	4.51	25.5	3.6
17 Jun	168	2.53	58.2	18.9

1975	*Fama Daehnfeldt*		Fife	
20 Apr	110	4.92	18.7	12.6
3 May	123	5.55	8.3	3.4
17 May	137	6.05	0.0	0.0
30 May	150	4.51	25.5	3.1
14 Jun	165	2.53	58.2	14.4
1976	*Fama Daehnfeldt*		Midlothian	
20 Apr	111	5.19	5.1	2.9
3 May	124	5.47	0.0	0.0
17 May	138	5.29	3.3	3.6
30 May	151	4.51	17.6	13.4
14 Jun	166	3.60	34.2	32.5
1976	*Fama Daehnfeldt*		Midlothian	
20 Apr	111	6.02	10.3	2.9
3 May	124	6.71	0.0	0.0
17 May	138	6.59	1.8	3.6
30 May	151	5.32	20.7	13.4
14 Jun	166	4.11	38.7	32.5
1976	*Fama Daehnfeldt*		Midlothian	
20 Apr	111	5.80	2.5	2.9
3 May	124	5.95	0.0	0.0
17 May	138	5.90	0.8	3.6
30 May	151	3.65	38.7	13.4
14 Jun	166	3.10	47.9	32.5
1976	*Fama Daehnfeldt*		Midlothian	
15 Apr	106	6.00	6.2	15.5
30 Apr	121	6.00	6.2	3.9
15 May	136	6.40	0.0	0.0
31 May	152	5.22	18.4	4.7
15 Jun	167	3.76	41.2	17.7
1977	*Fama Daehnfeldt*		Boghall	
20 Apr	110	5.13	0.0	0.0
17 May	137	4.51	12.1	13.4
30 May	150	3.58	30.2	29.5
14 Jun	165	3.08	40.0	55.7

ANNEX 7 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1977	*Fama Daehnfeldt*		Kinross	
20 Apr	110	7.35	10.7	12.6
3 May	123	7.55	8.3	3.4
17 May	137	8.23	0.0	0.0
30 May	150	6.61	19.7	3.1
14 Jun	165	3.59	56.4	14.4
1982	*Marian*		NOSCA	
1 May	121	8.75	0.0	0.0
8 May	128	7.23	17.4	0.9
15 May	135	7.09	19.0	3.6
22 May	142	4.21	51.9	8.1
29 May	149	5.10	41.7	14.4
5 Jun	156	2.56	70.7	22.6
12 Jun	163	1.98	77.4	32.5
1983	*Marian*		NOSCA	
1 May	121	7.77	0.0	0.0
8 May	128	5.90	24.1	0.9
15 May	135	6.00	22.8	3.0
22 May	142	5.02	35.4	8.1
29 May	149	4.68	39.8	14.4
5 Jun	156	4.94	36.4	22.6
12 Jun	163	6.96	10.4	32.5
1975	*Ruta Otofte*		Boghall	
20 Apr	110	6.79	0.0	0.0
3 May	123	6.59	2.9	3.1
17 May	137	5.53	18.6	13.4
30 May	150	6.05	10.9	29.5
14 Jun	165	4.80	29.3	55.7
1975	*Ruta Otofte*		Boghall	
15 Apr	105	6.37	0.8	3.9
30 Apr	120	6.42	0.0	0.0
15 May	135	6.33	1.4	4.2
31 May	151	5.65	12.0	17.7
15 Jun	166	3.77	41.3	39.0
1975	*Ruta Otofte*		Fife	
18 Apr	108	5.62	8.5	2.1
29 Apr	119	6.14	0.0	0.0
16 May	136	5.89	4.1	5.3
30 May	150	5.08	17.3	17.7
17 Jun	168	2.60	57.7	44.2
1976	*Ruta Otofte*		Bush	
16 Apr	107	7.86	0.0	0.0
30 Apr	121	7.17	8.8	3.6
14 May	135	7.23	8.0	14.4
31 May	152	6.36	19.1	37.3
15 Jun	167	4.84	37.6	66.3
1976	*Ruta Otofte*		Midlothian	
22 Apr	113	6.20	7.6	2.1
3 May	124	6.71	0.0	0.0
18 May	139	6.59	1.8	4.1
4 Jun	156	5.32	20.7	18.9
14 Jun	166	4.11	38.7	32.5
1977	*Ruta Otofte*		Boghall	
20 Apr	110	4.51	2.3	12.6
17 May	137	4.62	0.0	0.0
30 May	150	4.10	11.3	3.1
14 Jun	165	3.26	29.4	14.4
1977	*Ruta Otofte*		Bush	
15 Apr	105	4.51	2.4	16.5
16 May	136	4.62	0.0	0.0
30 May	150	4.10	12.1	3.6
15 Jun	166	3.26	29.4	16.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1977	*Ruta Otofte*		Kinross	
20 Apr	110	7.43	7.1	12.6
3 May	123	6.72	16.0	3.4
17 May	137	8.00	0.0	0.0
30 May	150	6.99	12.6	3.1
14 Jun	165	3.00	62.5	14.4
1977	*Ruta Otofte*		Milnathort	
20 Apr	110	7.43	7.1	13.5
6 May	126	6.72	16.0	2.5
18 May	138	8.00	0.0	0.0
31 May	151	6.99	12.6	3.1
15 Jun	166	3.00	62.5	14.4
1978	*Ruta Otofte*		Craibstone	
1 May	121	9.63	0.0	0.0
8 May	128	6.77	29.7	0.9
15 May	135	5.58	42.1	3.6
22 May	142	6.27	34.9	8.1
29 May	149	5.22	45.8	14.4
5 Jun	156	5.35	44.4	22.6
12 Jun	163	5.42	43.7	32.5
1979	*Ruta Otofte*		Craibstone	
1 May	121	6.82	1.2	0.8
8 May	128	6.90	0.0	0.0
15 May	135	6.46	6.4	0.9
22 May	142	6.12	11.3	3.6
29 May	149	6.33	8.3	8.1
5 Jun	156	5.66	18.0	14.4
12 Jun	163	3.61	47.7	22.6
1980	*Ruta Otofte*		Craibstone	
1 May	122	7.67	0.0	0.0
8 May	129	6.97	9.1	0.9
15 May	136	7.23	5.7	3.6
22 May	143	7.00	8.7	8.1
29 May	150	6.90	10.0	14.4
5 Jun	157	6.36	17.1	22.6
12 Jun	164	4.15	45.9	32.5
1981	*Ruta Otofte*		Craibstone	
1 May	121	3.14	39.8	13.5
8 May	128	2.62	49.7	7.6
15 May	135	4.67	10.4	3.4
22 May	142	4.38	15.9	0.8
29 May	149	5.21	0.0	0.0
5 Jun	156	3.87	25.7	0.9
12 Jun	163	2.94	43.6	3.6
1975	*W. Sator Otofte*		Fife	
15 Apr	105	6.30	1.6	15.5
30 Apr	120	6.20	3.1	3.9
15 May	135	6.40	0.0	0.0
31 May	151	4.91	28.3	4.7
15 Jun	166	3.48	45.6	17.7
1976	*W. Sator Otofte*		Bush	
16 Apr	107	7.97	0.0	0.0
30 Apr	121	7.31	8.3	3.6
14 May	135	7.60	4.6	14.4
31 May	152	6.44	19.2	37.3
15 Jun	167	4.79	39.9	66.3
1976	*W. Sator Otofte*		Carsewell	
22 Apr	113	5.80	2.5	2.1
3 May	124	5.95	0.0	0.0
18 May	139	5.90	0.8	4.1
4 Jun	156	3.65	38.7	18.9
14 Jun	166	3.10	47.9	32.5
1977	*W. Sator Otofte*		Bush	
15 Apr	105	5.13	0.0	0.0
16 May	136	4.51	12.1	17.7
30 May	150	3.58	30.2	37.3
15 Jun	166	3.08	40.0	68.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1977	*W. Sator Otofte*		Kinross	
20 Apr	110	7.35	10.7	13.5
6 May	126	7.55	8.3	2.5
18 May	138	8.23	0.0	0.0
31 May	151	6.61	19.7	3.1
15 Jun	166	3.39	58.8	14.4
1949	*Wilhelmsburger*		Craibstone	
1 May	121	2.53	0.0	0.0
8 May	128	2.34	7.5	0.9
15 May	135	2.49	1.6	3.6
22 May	142	2.47	2.4	8.1
29 May	149	2.50	1.2	14.4
5 Jun	156	2.30	9.1	22.6
1950	*Wilhelmsburger*		Craibstone	
1 May	121	3.71	0.0	0.0
8 May	128	3.70	0.3	0.9
15 May	135	3.29	11.3	3.6
29 May	149	3.01	18.9	14.4
5 Jun	156	3.62	2.4	22.6
1951	*Wilhelmsburger*		Craibstone	
1 May	121	3.82	0.0	0.0
8 May	128	3.33	12.8	0.9
15 May	135	3.62	5.2	3.6
22 May	142	3.00	21.5	8.1
29 May	149	2.67	30.1	14.4
5 Jun	156	1.88	50.8	22.6
1952	*Wilhelmsburger*		Craibstone	
1 May	122	4.75	0.0	0.0
8 May	129	3.97	16.4	0.9
15 May	136	3.65	23.2	3.6
22 May	143	3.43	27.8	8.1
29 May	150	3.46	27.2	14.4
5 Jun	157	3.35	29.5	22.6
1953	*Wilhelmsburger*		Craibstone	
1 May	121	2.79	0.0	0.0
8 May	128	2.50	10.4	0.9
15 May	135	2.67	4.3	3.6
22 May	142	2.62	6.1	8.1
29 May	149	2.03	27.2	14.4
5 Jun	156	2.49	10.8	22.6
1954	*Wilhelmsburger*		Craibstone	
1 May	121	2.65	0.0	0.0
8 May	128	2.61	1.5	0.9
15 May	135	2.37	10.6	3.6
22 May	142	2.54	4.2	8.1
29 May	149	2.10	20.8	14.4
5 Jun	156	1.97	25.7	22.6
1955	*Wilhelmsburger*		Craibstone	
1 May	121	2.50	8.8	13.5
8 May	128	2.25	17.9	7.6
15 May	135	2.50	8.8	3.4
22 May	142	2.39	12.8	0.8
29 May	149	2.74	0.0	0.0
5 Jun	156	2.58	5.8	0.9
1956	*Wilhelmsburger*		Craibstone	
1 May	122	2.96	11.1	3.4
8 May	129	3.30	0.9	0.8
15 May	136	3.33	0.0	0.0
22 May	143	2.76	17.7	0.9
29 May	150	2.39	28.2	3.6
5 Jun	157	2.04	28.7	8.1

ANNEX 7 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Yield loss, % Calc.
1957	*Wilhelmsburger*		Craibstone	
1 May	121	2.59	0.0	0.0
8 May	128	2.49	3.9	0.9
15 May	135	2.17	16.2	3.6
22 May	142	2.02	22.0	8.1
29 May	149	1.83	29.3	14.4
5 Jun	156	1.68	35.1	22.6
1958	*Wilhelmsburger*		Craibstone	
1 May	121	2.61	9.7	0.9
8 May	128	2.89	0.0	0.0
15 May	135	2.64	8.7	0.9
22 May	142	2.56	11.4	3.6
29 May	149	2.16	25.5	8.1
5 Jun	156	2.08	28.0	14.4
1959	*Wilhelmsburger*		Craibstone	
1 May	121	2.71	4.6	0.8
8 May	128	2.84	0.0	0.0
15 May	135	2.62	7.7	0.9
22 May	142	2.49	12.3	3.6
29 May	149	2.15	24.3	8.1
5 Jun	156	2.00	29.5	14.4
1960	*Wilhelmsburger*		Craibstone	
1 May	122	3.85	0.0	0.0
8 May	129	3.43	10.9	0.9
15 May	136	3.62	6.0	3.6
22 May	143	3.68	4.4	8.1
29 May	150	3.73	3.1	14.4
5 Jun	157	1.87	51.4	22.6

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Yield loss, % Calc.
1961	*Wilhelmsburger*		Craibstone	
1 May	121	3.40	0.0	0.0
8 May	128	3.15	7.4	0.9
15 May	135	3.16	7.0	3.6
22 May	142	3.04	10.6	8.1
29 May	149	2.71	20.3	14.4
5 Jun	156	2.60	23.5	22.6
1962	*Wilhelmsburger*		Craibstone	
1 May	121	3.05	0.0	0.0
8 May	128	2.77	9.2	0.9
15 May	135	2.41	21.0	3.6
22 May	142	2.69	11.8	8.1
29 May	149	2.38	22.0	14.4
5 Jun	156	2.03	33.4	22.6
1963	*Wilhelmsburger*		Craibstone	
1 May	121	2.18	1.8	0.8
8 May	128	2.22	0.0	0.0
15 May	135	2.04	8.1	0.9
22 May	142	2.19	1.4	3.6
5 Jun	156	1.89	14.9	14.4
1964	*Wilhelmsburger*		Craibstone	
1 May	122	3.40	1.2	3.4
8 May	129	3.24	5.8	0.8
15 May	136	3.44	0.0	0.0
22 May	143	3.36	2.3	0.9
29 May	150	2.94	14.5	3.6
5 Jun	157	2.83	17.7	8.1

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Yield loss, % Calc.
1965	*Wilhelmsburger*		Craibstone	
1 May	121	2.74	0.0	0.0
8 May	128	2.67	2.6	0.9
15 May	135	2.67	2.6	3.6
22 May	142	2.39	12.8	8.1
29 May	149	2.31	15.7	14.4
5 Jun	156	2.24	18.2	22.6
1966	*Wilhelmsburger*		Craibstone	
1 May	121	1.97	10.5	3.4
8 May	128	1.93	12.3	0.8
15 May	135	2.20	0.0	0.0
22 May	142	2.11	4.1	0.9
29 May	149	2.18	0.9	3.6
5 Jun	156	1.97	10.5	8.1
1982	*Wilhelmsburger*		Craibstone	
1 May	121	3.90	33.9	0.8
8 May	128	5.90	0.0	0.0
15 May	135	5.80	1.7	0.9
22 May	142	5.80	1.7	3.6
29 May	149	5.80	1.7	8.1
5 Jun	156	5.50	6.8	14.4
12 Jun	163	5.00	15.3	22.6
1982	*Wilhelmsburger*		Craibstone	
1 May	121	7.30	0.0	0.0
8 May	128	7.20	1.3	0.9
15 May	135	7.00	4.1	3.6
22 May	142	6.80	6.8	8.1
29 May	149	6.30	13.7	14.4
5 Jun	156	5.80	20.5	22.5

ANNEX 8 Turnips: percentage yield losses from untimely establishment.

1949	*The Wallace*		Craibstone	
8 May	128	3.57	0.0	0.0
15 May	135	2.94	17.6	1.6
22 May	142	2.66	25.5	6.2
29 May	149	2.44	31.7	14.0
5 Jun	156	2.66	25.5	24.9
12 Jun	163	2.61	26.9	38.9
1950	*The Wallace*		Craibstone	
15 May	135	5.30	0.0	0.0
22 May	142	4.80	9.4	1.6
5 Jun	156	4.50	15.1	14.0
12 Jun	163	4.14	21.9	24.9
1951	*The Wallace*		Craibstone	
8 May	128	9.19	0.0	0.0
15 May	135	7.78	15.3	1.6
22 May	142	7.68	16.4	6.2
29 May	149	6.38	30.6	14.0
5 Jun	156	5.80	36.9	24.9
12 Jun	163	5.17	43.7	38.9
1952	*The Wallace*		Craibstone	
8 May	129	9.29	4.9	2.4
15 May	136	9.77	0.0	0.0
22 May	143	8.36	14.4	1.6
29 May	150	7.93	18.8	6.2
5 Jun	157	6.83	30.1	14.0
12 Jun	164	7.21	26.2	24.9

1953	*The Wallace*		Craibstone	
8 May	128	4.87	20.6	9.7
15 May	135	5.40	11.9	2.4
22 May	142	6.13	0.0	0.0
29 May	149	5.73	6.5	1.6
5 Jun	156	5.32	13.2	6.2
12 Jun	163	4.72	23.0	14.0
1954	*The Wallace*		Craibstone	
8 May	128	7.08	6.3	21.9
15 May	135	7.38	2.4	9.7
22 May	142	7.03	7.0	2.4
29 May	149	7.56	0.0	0.0
5 Jun	156	5.98	20.9	1.6
12 Jun	163	6.08	19.6	6.2
1955	*The Wallace*		Craibstone	
8 May	128	4.19	9.7	10.4
15 May	135	4.47	4.9	2.4
22 May	142	4.70	0.0	0.0
29 May	149	4.12	12.3	1.6
5 Jun	156	3.79	19.4	6.2
12 Jun	163	3.94	16.2	14.0
1956	*The Wallace*		Craibstone	
8 May	129	8.29	0.0	0.0
12 May	136	7.31	11.8	1.6
22 May	143	7.76	6.4	6.2
29 May	150	7.33	11.6	14.0
5 Jun	157	6.68	19.4	24.9
12 Jun	164	5.98	27.9	38.9

1957	*The Wallace*		Craibstone	
8 May	128	6.43	0.0	0.0
15 May	135	5.73	10.9	1.6
22 May	142	5.60	12.9	6.2
29 May	149	4.22	34.4	14.0
5 Jun	156	3.41	47.0	29.9
12 Jun	163	3.36	47.7	38.9
1958	*The Wallace*		Craibstone	
8 May	128	6.35	9.0	21.9
15 May	135	6.78	2.9	9.7
22 May	142	6.18	11.5	2.4
29 May	149	6.98	0.0	0.0
5 Jun	156	6.68	4.3	1.6
12 Jun	163	6.00	14.0	6.2
1959	*The Wallace*		Craibstone	
8 May	128	5.65	0.0	0.0
15 May	135	4.80	15.0	1.6
22 May	142	3.57	36.8	6.2
29 May	149	3.99	29.4	14.0
5 Jun	156	3.29	41.8	24.9
12 Jun	163	2.99	47.1	38.9
1960	*The Wallace*		Craibstone	
8 May	129	6.33	0.0	0.0
15 May	136	6.33	0.0	1.6
22 May	143	6.00	5.2	6.2
29 May	150	5.25	17.1	14.0
5 Jun	157	5.50	13.1	24.9
12 Jun	164	4.42	30.2	38.9

ANNEX 8 (Continued)

Sowing day, Date	No.	Yield, t/ha	Yield loss, % Exp.	Calc.
1961	*The Wallace*		Craibstone	
8 May	128	6.93	0.0	0.0
15 May	135	6.48	6.5	1.6
22 May	142	6.18	10.8	6.2
29 May	149	6.45	6.9	14.0
5 Jun	156	5.30	23.5	24.9
12 Jun	163	4.80	30.7	38.9
1962	*The Wallace*		Craibstone	
8 May	128	7.04	8.7	2.4
15 May	135	7.71	0.0	0.0
22 May	142	6.98	9.5	1.6
29 May	149	7.13	7.5	6.2
5 Jun	156	6.58	14.7	14.0
12 Jun	163	5.80	24.8	24.9
1963	*The Wallace*		Craibstone	
8 May	128	4.65	0.0	0.0
15 May	135	4.34	6.7	1.6
22 May	142	4.47	3.9	6.2
29 May	149	3.59	22.8	14.0
5 Jun	156	4.17	10.3	24.9
12 Jun	163	4.07	12.5	38.9
1964	*The Wallace*		Craibstone	
8 May	129	7.51	11.0	9.7
15 May	136	7.18	14.9	2.4
22 May	143	8.44	0.0	0.0
29 May	150	7.46	11.6	1.6
5 Jun	157	7.63	9.6	6.2
12 Jun	164	7.38	12.6	14.0
1965	*The Wallace*		Craibstone	
8 May	128	5.98	18.8	2.4
15 May	135	7.36	0.0	0.0
22 May	142	5.90	19.8	1.6
29 May	149	6.40	13.0	6.2
5 Jun	156	6.50	11.7	14.0
12 Jun	163	6.60	10.3	24.9
1966	*The Wallace*		Craibstone	
8 May	128	4.95	9.7	10.4
15 May	135	4.85	12.1	2.4
22 May	142	5.52	0.0	0.0
29 May	149	5.30	4.0	1.6
5 Jun	156	5.47	0.9	6.2
12 Jun	163	4.95	10.3	14.0
1967	*The Wallace*		Craibstone	
8 May	128	4.62	39.4	9.7
15 May	135	6.45	15.5	2.4
22 May	142	7.63	0.0	0.0
29 May	149	6.78	11.1	1.6
5 Jun	156	6.63	13.1	6.2
1968	*The Wallace*		Craibstone	
8 May	129	5.80	0.0	0.0
15 May	136	5.20	10.3	1.6
22 May	143	5.10	12.1	6.2
29 May	150	5.67	2.2	14.0
5 Jun	157	5.10	12.1	24.9
1969	*The Wallace*		Craibstone	
15 May	135	5.85	26.2	21.9
22 May	142	6.48	18.3	9.7
29 May	149	6.30	20.6	2.4
5 Jun	156	7.93	0.0	0.0
12 Jun	163	5.40	31.9	1.6
1970	*The Wallace*		Craibstone	
8 May	128	5.12	24.1	21.9
15 May	135	4.95	26.7	9.7
22 May	142	6.15	8.9	2.4
29 May	149	6.75	0.0	0.0
5 Jun	156	5.85	13.3	1.6
1971	*The Wallace*		Craibstone	
1 May	121	3.91	21.5	38.9
8 May	128	3.96	20.5	21.9
15 May	135	4.70	5.6	9.7
22 May	142	4.94	0.8	2.4
29 May	149	4.98	0.0	0.0
5 Jun	156	4.89	1.8	1.6
1972	*The Wallace*		Craibstone	
1 May	122	3.56	22.4	21.9
8 May	129	4.10	10.7	9.7
15 May	136	4.35	5.2	2.4
22 May	143	4.59	0.0	0.0
29 May	150	4.50	2.0	1.6
5 Jun	157	4.16	9.4	6.2
1973	*The Wallace*		Craibstone	
1 May	121	4.01	23.8	9.7
8 May	128	4.52	14.1	2.4
15 May	135	5.26	0.0	0.0
22 May	142	4.53	13.9	1.6
29 May	149	4.29	18.4	6.2
5 Jun	156	4.60	12.5	14.0
1974	*The Wallace*		Craibstone	
8 May	128	7.06	6.2	38.9
15 May	135	7.05	6.4	21.9
22 May	142	5.56	26.2	9.7
29 May	149	6.87	8.8	2.4
5 Jun	156	7.53	0.0	0.0
12 Jun	163	6.74	10.5	1.6
1975	*The Wallace*		Craibstone	
1 May	121	3.84	28.2	38.9
8 May	128	3.12	41.7	21.9
15 May	135	3.28	38.7	9.7
22 May	142	4.22	21.1	2.4
29 May	149	5.35	0.0	0.0
5 Jun	156	3.90	27.1	1.6
12 Jun	163	3.32	37.9	6.2
1976	*The Wallace*		Craibstone	
1 May	122	2.30	3.0	21.9
8 May	129	2.31	2.5	9.7
15 May	136	1.57	33.8	2.4
22 May	143	2.37	0.0	0.0
29 May	150	1.95	17.7	1.6
5 Jun	157	1.88	20.7	6.2
12 Jun	164	1.95	17.7	14.0
1977	*The Wallace*		Craibstone	
1 May	121	6.46	3.9	2.4
8 May	128	6.72	0.0	0.0
15 May	135	6.59	1.9	1.6
22 May	142	6.66	0.9	6.2
29 May	149	5.89	12.4	14.0
5 Jun	156	5.56	17.3	24.9
12 Jun	163	5.29	21.3	38.9
1978	*The Wallace*		Craibstone	
1 May	121	6.05	0.0	0.0
8 May	128	5.64	6.8	1.6
15 May	135	5.96	1.5	6.2
22 May	142	5.48	9.4	14.0
29 May	149	5.89	2.6	24.9
5 Jun	156	5.01	17.2	38.9
12 Jun	163	4.59	24.1	56.0
1979	*The Wallace*		Craibstone	
1 May	121	6.71	17.8	21.9
8 May	128	6.23	23.7	9.7
15 May	135	6.30	22.8	2.4
22 May	142	8.16	0.0	0.0
29 May	149	6.71	17.8	1.6
5 Jun	156	5.47	33.0	6.2
12 Jun	163	4.90	40.0	14.0
1980	*The Wallace*		Craibstone	
1 May	122	5.31	8.1	21.9
8 May	129	5.33	7.8	9.7
15 May	136	5.60	3.1	2.4
22 May	143	5.78	0.0	0.0
29 May	150	5.52	4.5	1.6
5 Jun	157	5.28	8.7	6.2
12 Jun	164	3.55	38.6	14.0
1981	*The Wallace*		Craibstone	
1 May	121	3.36	53.9	38.9
8 May	128	2.92	59.9	21.9
15 May	135	5.05	30.7	10.4
22 May	142	4.48	38.5	2.4
29 May	149	7.29	0.0	0.0
5 Jun	156	3.97	45.5	1.6
12 Jun	163	2.96	59.4	6.2
1982	*The Wallace*		Craibstone	
1 May	121	5.84	0.0	0.0
8 May	128	4.24	27.4	1.6
15 May	135	3.83	34.4	6.2
22 May	142	4.20	28.1	14.0
29 May	149	3.48	40.4	24.9
5 Jun	156	2.37	59.4	38.9
12 Jun	163	1.78	69.5	56.0
1983	*The Wallace*		Craibstone	
1 May	121	5.56	24.3	9.7
8 May	128	3.42	53.4	2.4
15 May	135	7.34	0.0	0.0
22 May	142	6.99	4.8	1.6
29 May	149	7.23	1.5	6.2
5 Jun	156	6.58	10.4	14.0
12 Jun	163	6.42	12.5	24.9

APPENDIX 2 Timeliness coefficients for early and late establishment of 8 crops for a general yield loss equation of the form:
$YL = K_1(to-t)^2 + K_2(to-t)$

Crop	Establishment period	Timeliness coefficient x 10^{-3} / Standard error x 10^{-3} K1		K2		Correlation coefficient	Degree of freedom
Winter barley	Both	5.57	0.41	Suppressed		0.53	195
	Early	Suppressed		320	34.1	0.67	50
	Late	Suppressed		-326	23.8	0.75	145
	Early	-5.74	1.00	676	68.9	0.76	50
	Late	-3.38	0.78	-522	58.6	0.78	145
	Both	3.37	0.45	-49.7	28.2	0.54	195
Winter wheat	Both	4.37	0.23	Suppressed		0.65	480
	Early	Suppressed		284	22.5	0.59	161
	Late	Suppressed		-318	10.6	0.86	319
	Early	-5.73	1.15	553	58.1	0.63	161
	Late	-0.19	0.41	-306	27.6	0.86	319
	Both	4.38	0.25	-2.88	15.5	0.65	480
Spring barley	Both	10.80	0.42	Suppressed		0.78	422
	Early	Suppressed		404	27.0	0.76	94
	Late	Suppressed		-565	19.2	0.85	328
	Early	-8.28	1.93	691	71.8	0.78	94
	Late	-1.83	1.29	-649	61.7	0.85	328
	Both	9.30	0.57	-101	26.4	0.79	422
Spring wheat	Both	10.6	0.99	Suppressed		0.79	68
	Early	Suppressed		425	56.4	0.78	14
	Late	Suppressed		-554	49.8	0.83	54
	Early	-15.2	3.96	996	157	0.85	14
	Late	3.17	3.44	-403	171	0.84	54
	Both	9.93	1.24	-50.9	59.4	0.79	68
Oats	Both	18.8	0.56	Suppressed		0.82	556
	Early	Suppressed		564	32.0	0.78	145
	Late	Suppressed		-931	24.2	0.88	411
	Early	-15.2	2.46	1060	85.5	0.81	145
	Late	-2.82	1.81	-1050	81.9	0.89	411
	Both	15.5	0.76	-205	33.2	0.83	556
Potatoes	Both	8.21	0.36	Suppressed		0.75	404
	Early	Suppressed		374	22.6	0.77	117
	Late	Suppressed		-562	19.5	0.86	287
	Early	-5.55	1.13	656	61.3	0.80	117
	Late	-3.80	1.12	-766	63.2	0.87	287
	Both	7.34	3.80	-118	21.1	0.77	404

APPENDIX 2 contd

Crop	Establish-ment period	Timeliness coefficient x 10^{-3} [Standard error] x 10^{-3} K1	K2	Correlation coefficient	Degree of freedom
Swedes	Both	18.4 [0.89]	Suppressed	0.76	319
	Early	Suppressed	512 [51.3]	0.69	53
	Late	Suppressed	-806 [31.0]	0.85	265
	Early	-31.4 [6.72]	1260 [168]	0.75	53
	Late	-6.55 [2.31]	-1050 [91.5]	0.85	265
	Both	12.3 [1.45]	-287 [55.8]	0.78	319
Turnips	Both	34.0 [2.11]	Suppressed	0.74	231
	Early	Suppressed	1160 [97.9]	0.78	59
	Late	Suppressed	-974 [49.3]	0.85	154
	Early	-42.5 [14.9]	1980 [306]	0.80	59
	Late	-10.0 [5.60]	-1240 [159]	0.85	154
	Both	36.3 [2.73]	98.9 [73.3]	0.73	213

APPENDIX 3

Table 1a Predicted performance parameters for optional tyres for 4-WD tractors (unequal).

Power (kW)		Tyre size (in)	Tyre dimension b (m)	h (m)	c (m)	d (m)	Traction parameter Ctmax	CT	K	CRR	TE	Axle load W (kN)	Pressure P (kPa)	Mobility no.
54	F	11.2-28.0	0.28	0.21	1.14	0.04	0.748	0.412	8.02	0.064	75.4	18.1	80.0	19.03
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.756	0.420	8.26	0.061		29.3	80.0	23.13
55	F	11.1-28.0	0.28	0.21	0.43	0.04	0.711	0.401	7.73	0.076		19.7	170.0	10.78
	R	12.4-28.0	0.43	0.32	1.51	0.06	0.739	0.407	7.88	0.067	73.7	27.6	170.0	16.11
58	F	11.2-28.0	0.28	0.21	1.14	0.04	0.748	0.412	8.02	0.064	75.4	18.1	80.0	19.03
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.756	0.420	8.26	0.061		29.3	80.0	23.13
60	F	11.1-28.0	0.28	0.21	1.13	0.04	0.739	0.407	7.88	0.067	73.7	19.7	170.0	16.11
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.711	0.401	7.73	0.076		27.6	170.0	10.78
61	F	11.1-28.0	0.28	0.21	1.13	0.04	0.737	0.407	7.86	0.067	73.7	21.7	170.0	15.63
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.712	0.402	7.73	0.075		35.8	170.0	10.97
62	F	11.2-28.0	0.28	0.21	1.14	0.04	0.748	0.412	8.02	0.064	75.4	18.1	80.0	19.03
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.756	0.420	8.26	0.061		29.3	80.0	23.13
63	F	12.4-28.0	0.31	0.24	1.18	0.05	0.743	0.410	7.93	0.066	75.1	22.7	80.0	17.33
	R	18.4-34.0	0.47	0.35	1.57	0.07	0.752	0.416	8.13	0.063		36.5	80.0	20.84
65	F	11.1-28.0	0.28	0.21	1.13	0.04	0.737	0.407	7.86	0.067	73.7	21.7	170.0	15.63
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.712	0.402	7.73	0.075		35.3	170.0	10.97
66	F	12.4-28.0	0.31	0.24	1.18	0.05	0.741	0.408	7.90	0.066	74.9	23.6	80.0	16.67
	R	16.9-38.0	0.43	0.32	1.61	0.06	0.747	0.412	8.01	0.064		39.0	80.0	18.69
69	F	12.4-28.0	0.31	0.24	1.18	0.05	0.743	0.410	7.93	0.066	75.1	22.7	80.0	17.33
	R	18.4-34.0	0.47	0.35	1.57	0.07	0.752	0.416	8.13	0.063		36.5	80.0	20.84
70	F	11.1-28.0	0.28	0.21	1.13	0.04	0.739	0.407	7.88	0.067	73.7	21.1	170.0	16.11
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.711	0.401	7.73	0.076		36.5	170.0	10.78
71	F	12.4-28.0	0.31	0.24	1.18	0.05	0.736	0.407	7.85	0.068	74.0	25.5	160.0	15.44
	R	14.9-30.0	0.38	0.28	1.33	0.06	0.723	0.403	7.75	0.072		41.8	160.0	12.59
73	F	11.2-28.0	0.28	0.21	1.14	0.04	0.748	0.412	8.02	0.064	75.4	23.7	80.0	17.33
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.756	0.420	8.26	0.061		33.9	80.0	20.84
75	F	11.1-28.0	0.28	0.21	1.13	0.04	0.739	0.407	7.88	0.067	73.7	21.1	170.0	16.11
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.711	0.401	7.73	0.076		36.5	170.0	10.78
76	F	12.4-28.0	0.31	0.24	1.18	0.05	0.736	0.407	7.85	0.068	74.0	25.5	160.0	15.44
	R	14.9-30.0	0.38	0.28	1.33	0.06	0.723	0.403	7.75	0.072		41.8	160.0	12.59
77	F	12.4-28.0	0.31	0.24	1.18	0.05	0.744	0.410	7.96	0.065	75.1	22.0	80.0	17.85
	R	18.4-34.0	0.47	0.35	1.57	0.07	0.751	0.415	8.10	0.063		37.1	80.0	20.47
79	F	11.2-28.0	0.28	0.21	1.14	0.04	0.748	0.412	8.02	0.064	75.4	23.7	80.0	17.33
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.756	0.420	8.26	0.061		33.9	80.0	20.84
81	F	12.4-28.0	0.31	0.24	1.18	0.05	0.727	0.404	7.77	0.071	74.1	29.5	130.0	13.34
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.734	0.406	7.82	0.068		47.6	130.0	14.80
82	F	12.4-28.0	0.31	0.24	1.18	0.05	0.736	0.407	7.85	0.068	74.0	25.5	160.0	15.44
	R	14.9-30.0	0.38	0.28	1.33	0.06	0.723	0.403	7.75	0.072		41.8	160.0	12.59
84	F	12.4-28.0	0.31	0.24	1.18	0.05	0.739	0.408	7.88	0.067	74.9	25.9	80.0	16.21
	R	16.9-38.0	0.43	0.32	1.61	0.06	0.748	0.412	8.02	0.064		36.6	80.0	19.03
85	F	13.6-28.0	0.34	0.26	1.23	0.05	0.732	0.405	7.81	0.069	74.4	31.0	130.0	14.35
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.739	0.407	7.88	0.067		50.8	130.0	16.06
87	F	12.4-28.0	0.31	0.24	1.18	0.05	0.736	0.407	7.85	0.068	74.0	25.5	160.0	15.44
	R	14.9-30.0	0.38	0.28	1.33	0.06	0.723	0.403	7.75	0.072		41.8	160.0	12.59
90	F	12.4-28.0	0.31	0.24	1.18	0.05	0.719	0.402	7.74	0.073	73.5	35.0	130.0	11.93
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.721	0.403	7.75	0.072		46.8	130.0	12.27
93	F	13.6-28.0	0.34	0.26	1.23	0.05	0.730	0.405	7.80	0.069	74.4	31.7	130.0	14.04
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.739	0.408	7.89	0.067		50.1	130.0	16.28
94	F	12.4-28.0	0.31	0.24	1.18	0.05	0.727	0.404	7.77	0.071	74.1	29.5	130.0	13.34
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.734	0.406	7.82	0.068		47.6	130.0	14.80
97	F	12.4-28.0	0.31	0.24	1.18	0.05	0.719	0.402	7.74	0.073	73.5	33.0	110.0	11.93
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.721	0.403	7.75	0.072		52.9	110.0	12.27
98	F	12.4-28.0	0.31	0.24	1.18	0.05	0.717	0.402	7.74	0.073	73.4	33.6	110.0	11.69
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.722	0.403	7.75	0.072		52.3	110.0	12.43
100	F	13.6-28.0	0.34	0.26	1.23	0.05	0.730	0.405	7.80	0.069	74.4	31.7	130.0	14.04
	R	18.4-38.0	0.47	0.35	1.67	0.07	0.739	0.408	7.89	0.067		50.1	130.0	16.28
102	F	14.9-28.0	0.38	0.28	1.28	0.06	0.727	0.404	7.78	0.070	74.2	37.6	110.0	13.41
	R	23.1-26.0	0.59	0.44	1.54	0.09	0.736	0.406	7.84	0.068		59.1	110.0	15.34
103	F	12.4-28.0	0.31	0.24	1.18	0.05	0.719	0.402	7.74	0.073	73.5	38.0	110.0	11.93
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.721	0.403	7.75	0.072		47.9	110.0	12.27
104	F	12.4-28.0	0.31	0.24	1.18	0.05	0.719	0.402	7.74	0.073	73.5	33.0	110.0	11.93
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.721	0.403	7.75	0.072		52.9	110.0	12.27
105	F	12.4-28.0	0.31	0.24	1.18	0.05	0.717	0.402	7.74	0.073	73.4	33.6	110.0	11.69
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.722	0.403	7.75	0.072		52.3	110.0	12.43
110	F	14.9-28.0	0.38	0.28	1.28	0.06	0.727	0.404	7.78	0.070	74.2	38.0	110.0	13.41
	R	23.1-26.0	0.59	0.44	1.54	0.09	0.736	0.406	7.84	0.068		47.9	110.0	15.34
112	F	12.4-28.0	0.31	0.24	1.18	0.05	0.717	0.402	7.74	0.073	73.4	33.6	110.0	11.69
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.722	0.403	7.75	0.072		52.3	110.0	12.43
115	F	14.9-28.0	0.38	0.28	1.28	0.06	0.727	0.404	7.78	0.070	74.2	37.6	110.0	13.41
	R	23.1-26.0	0.57	0.44	1.54	0.09	0.736	0.406	7.84	0.068		59.1	110.0	15.34
	R	13.4-34.0	0.47	0.35	1.57	0.07	0.724	0.403	7.76	0.072		59.9	140.0	17.70
119	F	14.9-28.0	0.38	0.28	1.28	0.06	0.726	0.404	7.77	0.071	73.8	38.1	140.0	13.77
	R	18.4-34.0	0.47	0.35	1.57	0.07	0.724	0.403	7.76	0.072		59.9	140.0	17.70
125	F	14.9-28.0	0.38	0.28	1.28	0.06	0.727	0.404	7.78	0.070	74.2	37.6	110.0	13.41
	R	23.1-26.0	0.59	0.44	1.54	0.09	0.736	0.406	7.84	0.068		59.1	110.0	15.34

Axle load = Dynamic axle load,
F = Front wheel,
R = Rear wheel.

APPENDIX 3 cont'd

Table 2a Single 4-WD tractor (unequal)-plough combinations with implement work rate, maximum, actual and theoretical pull and tractor power (soil series Winton).

Ref no.	Plough Bodies	Plough Width (m)	Plough Depth (m)	Plough Speed (km/h)	Plough Work rate (ha/h)	Dynamic axle load Front (kN)	Dynamic axle load Rear (kN)	Slip (%)	Pull Actual (kN)	Pull Theor (kN)	Draw bar power (kW)	P.T.O power (kW)	Tractor power (kW)
24	5	0.25	0.20	5.72	0.57	23.74	33.85	11.93	23.17	28.35	36.35	55.21	63
25	5	0.25	0.20	6.16	0.62	23.74	33.85	11.93	23.17	28.35	39.69	59.46	68
26	5	0.25	0.20	6.61	0.66	23.74	33.85	11.93	23.17	28.35	42.52	63.71	73
27	5	0.25	0.20	7.05	0.70	23.74	33.85	11.93	23.17	28.35	45.35	67.95	78
33	6	0.25	0.20	5.73	0.69	22.99	34.60	11.88	23.17	28.29	36.87	55.12	63
34	6	0.25	0.20	6.17	0.74	22.99	34.60	11.88	23.17	28.29	39.70	59.37	68
35	6	0.25	0.20	6.61	0.79	22.99	34.60	11.88	23.17	28.29	42.54	63.61	73
36	6	0.25	0.20	7.05	0.85	22.99	34.60	11.88	23.17	28.29	45.37	67.85	77
70	4	0.25	0.20	6.22	0.50	19.75	27.60	11.11	19.64	23.31	33.94	49.18	56
71	4	0.25	0.20	6.67	0.53	19.75	27.60	11.11	19.64	23.31	36.37	52.70	60
72	4	0.25	0.20	7.11	0.57	19.75	27.60	11.11	19.64	23.31	38.79	56.21	64
77	5	0.25	0.20	5.34	0.53	18.98	28.36	11.06	19.61	23.22	29.07	42.03	48
78	5	0.25	0.20	5.78	0.58	18.98	28.36	11.06	19.61	23.22	31.50	45.54	52
79	5	0.25	0.20	6.23	0.62	18.98	28.36	11.06	19.61	23.22	33.92	49.04	56
80	5	0.25	0.20	6.67	0.67	18.98	28.36	11.06	19.61	23.22	36.34	52.54	60
81	5	0.25	0.20	7.12	0.71	18.98	28.36	11.06	19.61	23.22	38.77	56.05	64
141	6	0.25	0.20	5.74	0.69	27.80	39.49	11.69	27.15	32.97	43.30	64.24	73
142	6	0.25	0.20	6.18	0.74	27.80	39.49	11.69	27.15	32.97	46.63	69.18	79
143	6	0.25	0.20	6.62	0.79	27.80	39.49	11.69	27.15	32.97	49.96	74.12	85
144	6	0.25	0.20	7.06	0.85	27.80	39.49	11.69	27.15	32.97	53.29	79.06	90
150	7	0.25	0.20	5.74	0.80	27.04	40.26	11.65	27.14	32.90	43.30	64.14	73
151	7	0.25	0.20	6.18	0.87	27.04	40.26	11.65	27.14	32.90	46.63	69.07	79
152	7	0.25	0.20	6.63	0.93	27.04	40.26	11.65	27.14	32.90	49.96	74.01	85
153	7	0.25	0.20	7.07	0.99	27.04	40.26	11.65	27.14	32.90	53.29	78.94	90
136	5	0.25	0.20	5.77	0.58	24.81	34.37	11.20	24.38	29.05	39.09	56.84	65
137	5	0.25	0.20	6.22	0.62	24.81	34.37	11.20	24.38	29.05	42.10	61.21	70
138	5	0.25	0.20	6.66	0.67	24.81	34.37	11.20	24.38	29.05	45.11	65.58	75
139	5	0.25	0.20	7.10	0.71	24.81	34.37	11.20	24.38	29.05	48.11	69.96	80
195	6	0.25	0.20	5.78	0.69	24.04	35.14	11.15	24.36	28.97	39.07	56.71	65
196	6	0.25	0.20	6.22	0.75	24.04	35.14	11.15	24.36	28.97	42.08	61.07	70
197	6	0.25	0.20	6.66	0.80	24.04	35.14	11.15	24.36	28.97	45.08	65.43	75
198	6	0.25	0.20	7.11	0.85	24.04	35.14	11.15	24.36	28.97	48.09	69.80	80
257	7	0.25	0.20	5.28	0.74	32.72	44.38	11.93	31.21	38.10	45.82	68.65	78
258	7	0.25	0.20	5.72	0.80	32.72	44.38	11.93	31.21	38.10	49.64	74.37	85
259	7	0.25	0.20	6.16	0.86	32.72	44.38	11.93	31.21	38.10	53.45	80.09	92
260	7	0.25	0.20	6.61	0.92	32.72	44.38	11.93	31.21	38.10	57.27	85.81	98
261	7	0.25	0.20	7.05	0.99	32.72	44.38	11.93	31.21	38.10	61.09	91.53	105
266	8	0.25	0.20	5.29	0.85	31.92	45.18	11.88	31.21	38.01	45.84	68.55	78
267	8	0.25	0.20	5.73	0.92	31.92	45.18	11.88	31.21	38.01	49.66	74.26	85
268	8	0.25	0.20	6.17	0.99	31.92	45.18	11.88	31.21	38.01	53.48	79.97	91
269	8	0.25	0.20	6.61	1.06	31.92	45.18	11.88	31.21	38.01	57.30	85.69	98
270	8	0.25	0.20	7.05	1.13	31.92	45.18	11.88	31.21	38.01	61.12	91.40	105
303	6	0.25	0.20	5.76	0.69	25.92	36.64	11.32	25.62	30.66	41.02	59.96	68
304	6	0.25	0.20	6.21	0.74	25.92	36.64	11.32	25.62	30.66	44.18	64.57	74
305	6	0.25	0.20	6.65	0.80	25.92	36.64	11.32	25.62	30.66	47.34	69.18	79
306	6	0.25	0.20	7.09	0.85	25.92	36.64	11.32	25.62	30.66	50.49	73.80	84
356	7	0.25	0.20	5.74	0.80	35.09	46.75	11.62	33.29	40.28	53.13	78.60	90
357	7	0.25	0.20	6.19	0.87	35.09	46.75	11.62	33.29	40.28	57.21	84.64	97
358	7	0.25	0.20	6.63	0.93	35.09	46.75	11.62	33.29	40.28	61.30	90.69	104
359	7	0.25	0.20	7.07	0.99	35.09	46.75	11.62	33.29	40.28	65.39	96.74	111
375	8	0.25	0.20	5.75	0.92	34.29	47.55	11.58	33.28	40.19	53.13	78.48	90
376	8	0.25	0.20	6.19	0.99	34.29	47.55	11.58	33.28	40.19	57.22	84.51	97
377	8	0.25	0.20	6.63	1.06	34.29	47.55	11.58	33.28	40.19	61.30	90.55	104
378	8	0.25	0.20	7.07	1.13	34.29	47.55	11.58	33.28	40.19	65.39	96.59	111
421	7	0.25	0.20	6.13	0.86	37.97	47.93	12.40	34.45	42.78	58.68	89.70	103
422	7	0.25	0.20	6.57	0.92	37.97	47.93	12.40	34.45	42.78	62.87	96.11	110
423	7	0.25	0.20	7.01	0.98	37.97	47.93	12.40	34.45	42.78	67.06	102.51	117
428	8	0.25	0.20	5.26	0.84	37.13	48.76	12.36	34.48	42.70	50.36	76.83	88
429	8	0.25	0.20	5.70	0.91	37.13	48.76	12.36	34.48	42.70	54.56	83.23	95
430	8	0.25	0.20	6.14	0.98	37.13	48.76	12.36	34.48	42.70	58.75	89.63	103
431	8	0.25	0.20	6.57	1.05	37.13	48.76	12.36	34.48	42.70	62.95	96.03	110
432	8	0.25	0.20	7.01	1.12	37.13	48.76	12.36	34.48	42.70	67.15	102.44	117
434	8	0.25	0.20	6.18	0.99	41.92	56.08	11.77	39.55	48.16	67.85	100.99	116
435	8	0.25	0.20	6.62	1.06	41.92	56.08	11.77	39.55	48.16	72.70	108.21	124
436	8	0.25	0.20	7.06	1.13	41.92	56.08	11.77	39.55	48.16	77.55	115.42	132
538	8	0.25	0.20	6.19	0.99	41.17	55.55	11.61	39.25	47.49	67.46	99.76	114
539	8	0.25	0.20	6.63	1.06	41.17	55.55	11.61	39.25	47.49	72.28	106.89	122
540	8	0.25	0.20	7.07	1.13	41.17	55.55	11.61	39.25	47.49	77.10	114.02	131
645	8	0.25	0.20	6.86	1.10	53.78	56.46	14.29	40.09	54.13	76.37	126.88	145

APPENDIX 3 cont'd

Table 3a Summary of costing routine output for 4-WD tractors (unequal).

Sale age (Yr)	Power (kW)	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+i)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum interest charge ($)	Balancing charge ($)	Present annual cost ($)
5	52	13766.0	3724.7	0.972	3913.1	452.8	5250.9	14871.5	8744.5	4053.6	1350.4	2374.7
5	56	14821.2	4010.2	0.972	4213.1	478.6	5653.4	16011.5	9414.8	4364.3	1453.9	2555.3
5	58	15348.8	4152.9	0.972	4363.0	491.4	5854.6	16581.5	9749.9	4519.7	1505.6	2645.6
5	60	15876.5	4295.7	0.972	4513.0	504.3	6055.9	17151.5	10085.1	4675.1	1557.4	2736.0
5	61	16140.3	4367.1	0.972	4588.0	510.7	6156.5	17436.5	10252.7	4752.8	1583.3	2781.1
5	62	16404.1	4438.5	0.972	4663.0	517.2	6257.1	17721.5	10420.3	4830.4	1609.1	2826.3
5	63	16667.9	4509.8	0.972	4738.0	523.6	6357.8	18006.5	10587.8	4908.1	1635.0	2871.5
5	65	17195.5	4652.6	0.972	4888.0	536.5	6559.0	18576.5	10923.0	5063.5	1686.8	2961.8
5	66	17459.3	4724.0	0.972	4963.0	542.9	6659.6	18861.5	11090.6	5141.2	1712.7	3007.0
5	68	17986.9	4866.7	0.972	5113.0	555.8	6860.9	19431.5	11425.7	5296.5	1764.4	3097.3
5	70	18514.6	5009.5	0.972	5262.9	568.6	7062.1	20001.5	11760.9	5451.9	1816.2	3187.6
5	71	18778.4	5080.9	0.972	5337.9	575.1	7162.8	20286.5	11928.5	5529.6	1842.0	3232.8
5	73	19306.0	5223.6	0.972	5487.9	587.8	7364.0	20856.4	12263.6	5685.0	1893.8	3323.1
5	75	19833.6	5366.4	0.972	5637.9	600.3	7565.3	21426.4	12598.8	5840.3	1945.6	3413.4
5	76	20097.4	5437.8	0.972	5712.9	606.5	7665.9	21711.4	12766.4	5918.0	1971.4	3458.5
5	77	20361.2	5509.1	0.972	5787.9	612.7	7766.5	21996.4	12933.9	5995.7	1997.3	3503.7
5	78	20625.0	5580.5	0.972	5862.9	619.0	7867.2	22281.4	13101.5	6073.4	2023.2	3548.8
5	81	21416.5	5794.7	0.972	6087.8	637.7	8169.0	23136.4	13604.2	6306.4	2100.8	3684.2
5	82	21680.3	5866.0	0.972	6162.8	643.9	8269.7	23421.4	13771.8	6384.1	2126.7	3729.3
5	84	22207.9	6008.8	0.972	6312.8	656.4	8470.9	23991.4	14107.0	6539.5	2178.5	3819.6
5	86	22735.5	6151.6	0.972	6462.8	668.8	8672.2	24561.4	14442.1	6694.8	2230.2	3909.9
5	87	22999.3	6222.9	0.972	6537.8	675.1	8772.8	24846.4	14609.7	6772.5	2256.1	3955.0
5	90	23790.8	6437.1	0.972	6762.7	693.4	9074.7	25701.4	15112.4	7005.6	2333.7	4090.4
5	93	24582.2	6651.2	0.972	6987.7	711.6	9376.6	26556.4	15615.2	7238.6	2411.4	4225.7
5	94	24846.0	6722.6	0.972	7062.7	717.7	9477.2	26841.4	15782.8	7316.3	2437.2	4270.8
5	97	25637.4	6936.7	0.972	7287.7	735.9	9779.1	27696.4	16285.5	7549.3	2514.9	4406.1
5	98	25901.2	7008.1	0.972	7362.7	742.0	9879.7	27981.4	16453.1	7627.0	2540.8	4451.3
5	100	26428.9	7150.9	0.972	7512.6	754.1	10080.9	28551.3	16788.2	7782.4	2592.5	4541.5
5	102	26956.5	7293.6	0.972	7662.6	766.3	10282.2	29121.3	17123.4	7937.8	2644.3	4631.7
5	103	27220.3	7365.0	0.972	7737.6	772.3	10382.8	29406.3	17291.0	8015.4	2670.1	4676.8
5	105	27747.9	7507.8	0.972	7887.6	784.5	10584.1	29976.3	17626.1	8170.8	2721.9	4767.0
5	110	29067.0	7864.7	0.972	8262.5	814.4	11087.2	31401.3	18464.0	8559.2	2851.3	4992.5
5	112	29594.6	8007.4	0.972	8412.5	826.3	11288.5	31971.3	18799.2	8714.6	2903.1	5082.7
5	118	31177.4	8435.7	0.972	8862.5	861.7	11892.2	33681.3	19804.6	9180.7	3058.3	5353.2
5	119	31441.3	8507.1	0.972	8937.5	867.3	11992.9	33966.3	19972.2	9258.4	3084.2	5398.3
5	126	33237.9	9006.7	0.972	9462.4	909.4	12697.2	35961.3	21145.3	9802.7	3265.3	5714.0

i = investment interest rate.
g = inflation rate.

Table 4a Performance of 4-WD tractors (unequal) and utilisation of multiple combinations selected for a 100 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Set no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate (ha/h) †	Performance: Cult. work rate (ha/h) ‡	Performance: Drill work rate (ha/h) §	Yield loss value (£)
1	2	0.09	0.24	0.32	0.14	87.34	236.55	141.93	1.14	0.42	0.70	207.36
2	2	0.08	0.18	0.26	0.11	81.10	177.41	113.54	1.23	0.56	0.88	81.20
3	2	0.08	0.14	0.22	0.09	75.70	141.93	94.62	1.32	0.70	1.06	62.32
4	2	0.07	0.12	0.19	0.08	70.96	118.27	81.10	1.41	0.85	1.23	59.63
5	2	0.07	0.10	0.17	0.07	72.74	101.32	70.93	1.37	0.99	1.41	58.73
6	2	0.07	0.09	0.16	0.06	67.55	88.60	63.04	1.48	1.13	1.59	58.73
7	2	0.06	0.08	0.14	0.06	63.04	78.81	56.74	1.59	1.27	1.76	58.73
8	2	0.05	0.21	0.27	0.05	59.10	210.15	51.59	1.69	0.48	1.94	58.73
9	2	0.10	0.16	0.26	0.14	100.45	156.25	140.63	1.00	0.64	0.71	207.36
10	2	0.09	0.13	0.22	0.11	93.75	125.00	112.50	1.07	0.80	0.89	81.20
11	2	0.09	0.10	0.19	0.09	87.89	104.17	93.75	1.14	0.96	1.07	62.32
12	2	0.09	0.09	0.18	0.08	93.69	89.25	80.31	1.07	1.12	1.25	59.63
13	2	0.09	0.08	0.16	0.07	86.48	78.08	70.27	1.16	1.28	1.42	58.73
14	2	0.08	0.07	0.15	0.06	80.31	69.40	62.46	1.25	1.44	1.60	58.73
15	2	0.07	0.19	0.25	0.06	74.95	187.38	56.21	1.33	0.53	1.78	58.73
16	2	0.07	0.14	0.21	0.05	70.27	140.54	51.10	1.42	0.71	1.96	58.73
17	2	0.07	0.11	0.19	0.14	72.59	113.24	141.55	1.38	0.88	0.71	207.36
18	2	0.07	0.09	0.16	0.11	67.41	94.37	113.24	1.48	1.06	0.88	81.20
19	2	0.06	0.08	0.14	0.09	62.91	80.89	94.37	1.59	1.24	1.06	62.32
20	2	0.06	0.07	0.13	0.08	58.98	70.78	80.89	1.70	1.41	1.24	59.63
21	2	0.06	0.06	0.13	0.07	62.19	62.88	70.74	1.61	1.59	1.41	58.73
22	2	0.05	0.17	0.23	0.06	57.75	171.50	62.88	1.73	0.58	1.59	58.73
23	1	0.11	0.13	0.24	0.06	107.80	128.62	56.59	0.93	0.78	1.77	58.73
24	1	0.10	0.10	0.20	0.05	101.06	102.90	51.45	0.99	0.97	1.94	58.73
25	2	0.09	0.09	0.17	0.14	86.62	85.31	140.76	1.15	1.17	0.71	207.36
26	2	0.08	0.07	0.15	0.11	80.43	73.12	112.61	1.24	1.37	0.89	81.20
27	2	0.08	0.06	0.14	0.09	75.07	63.98	93.84	1.33	1.56	1.07	62.32
28	2	0.07	0.06	0.13	0.08	70.38	56.87	80.43	1.42	1.76	1.24	59.63
29	2	0.07	0.16	0.23	0.07	72.15	156.32	70.34	1.39	0.64	1.42	58.73
30	2	0.07	0.12	0.13	0.06	66.99	117.24	62.53	1.49	0.85	1.60	58.73
31	2	0.06	0.09	0.16	0.06	62.53	93.79	56.28	1.60	1.07	1.78	58.73
32	2	0.06	0.08	0.14	0.05	58.62	78.16	51.15	1.71	1.28	1.95	58.73
33	2	0.07	0.07	0.14	0.14	67.59	67.59	141.93	1.48	1.48	0.70	207.36
34	2	0.06	0.06	0.12	0.11	62.39	59.14	113.54	1.60	1.67	0.88	81.20
35	2	0.06	0.05	0.11	0.09	57.93	52.57	94.62	1.73	1.90	1.06	62.32
36	1	0.11	0.15	0.25	0.08	108.14	145.57	81.10	0.92	0.69	1.23	59.63
37	1	0.10	0.11	0.21	0.07	101.38	109.16	70.97	0.99	0.92	1.41	58.73
38	2	0.06	0.09	0.15	0.06	59.11	87.30	63.05	1.69	1.15	1.59	58.73
39	1	0.11	0.07	0.18	0.06	109.12	72.75	56.74	0.92	1.38	1.76	58.73
40	1	0.10	0.06	0.16	0.05	101.33	62.35	51.55	0.99	1.60	1.94	58.73
41	1	0.09	0.05	0.15	0.14	94.57	54.56	141.86	1.06	1.83	0.70	207.36
42	1	0.09	0.05	0.14	0.11	88.66	48.50	113.49	1.13	2.06	0.88	81.20
43	2	0.07	0.13	0.21	0.09	72.29	134.25	93.93	1.38	0.75	1.06	62.32
44	2	0.07	0.10	0.17	0.08	67.13	100.69	80.55	1.49	0.99	1.24	59.63
45	2	0.06	0.08	0.14	0.07	62.05	80.55	70.48	1.60	1.24	1.42	58.73
46	2	0.06	0.07	0.13	0.06	58.73	67.13	62.65	1.70	1.49	1.60	58.73
47	2	0.06	0.06	0.12	0.06	62.17	57.75	56.58	1.61	1.73	1.77	58.73
48	2	0.06	0.05	0.11	0.05	57.73	50.51	51.43	1.73	1.99	1.94	58.73
49	1	0.11	0.05	0.15	0.14	107.76	44.90	141.44	0.93	2.23	0.71	207.36
50	1	0.10	0.13	0.23	0.11	101.03	125.72	113.15	0.99	0.80	0.88	81.20
51	1	0.11	0.09	0.20	0.09	108.75	94.25	94.25	0.92	1.06	1.06	62.32
52	1	0.10	0.08	0.18	0.08	100.98	75.40	80.79	0.99	1.33	1.24	59.63
53	1	0.09	0.06	0.16	0.07	94.25	62.83	70.69	1.06	1.59	1.41	58.73
54	1	0.09	0.05	0.14	0.06	88.36	53.86	62.93	1.13	1.86	1.59	58.73
55	2	0.06	0.05	0.11	0.06	58.25	47.57	57.08	1.72	2.10	1.75	58.73
56	1	0.11	0.04	0.15	0.05	108.73	42.28	51.89	0.92	2.37	1.93	58.73
57	1	0.10	0.12	0.22	0.14	101.93	118.92	142.70	0.98	0.84	0.70	207.36
58	2	0.06	0.09	0.15	0.11	59.43	89.14	114.10	1.68	1.12	0.88	81.20
59	1	0.11	0.07	0.18	0.09	109.71	71.31	95.08	0.91	1.40	1.05	62.32
60	1	0.10	0.06	0.16	0.08	101.88	59.43	81.50	0.98	1.68	1.23	59.63
61	1	0.10	0.05	0.15	0.07	95.08	50.94	71.31	1.05	1.96	1.40	58.73
62	1	0.09	0.05	0.13	0.06	89.14	44.57	63.39	1.12	2.24	1.58	58.73
63	1	0.10	0.04	0.14	0.06	101.19	39.35	56.67	0.99	2.54	1.76	58.73
64	1	0.09	0.11	0.21	0.05	94.45	111.12	51.52	1.06	0.90	1.94	58.73
65	1	0.09	0.06	0.17	0.14	88.55	63.34	141.67	1.13	1.58	0.71	207.36
66	1	0.10	0.07	0.17	0.11	101.02	66.55	113.14	0.99	1.50	0.88	81.20
67	1	0.09	0.05	0.15	0.09	94.28	55.40	94.26	1.06	1.80	1.06	62.32
68	1	0.09	0.05	0.14	0.08	88.39	47.54	80.81	1.13	2.10	1.24	59.63
69	1	0.09	0.04	0.13	0.07	91.15	42.89	74.92	1.10	2.33	1.57	58.73

Tr = Tractors
† Plough work rate for tractor fleet
‡ Cult.=cultivator; work rate only using one tractor
§ Drill work rate only using one tractor.

Table 5a Performance of 4-WD tractors (unequal) and utilisation of multiple combinations selected for a 200 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 60% field efficieny together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Cultivation	Tillage	Drilling	Operation use: Ploughing (h)	Cultivation (h)	Drilling (h)	Performance: Plough work rate + (ha/h)	Cult. work rate * (ha/h)	Drill work rate @ (ha/h)	Yield loss value ($)
1	3	0.12	0.47	0.59	0.28	116.45	473.10	283.86	1.72	0.42	0.70	1147.15
2	2	0.16	0.35	0.52	0.23	162.21	354.82	227.09	1.23	0.56	0.88	671.63
3	2	0.15	0.28	0.44	0.19	151.39	283.86	189.24	1.32	0.70	1.06	501.02
4	2	0.14	0.24	0.38	0.16	141.93	236.55	162.20	1.41	0.85	1.23	441.68
5	2	0.15	0.20	0.35	0.14	145.49	202.64	141.85	1.37	0.99	1.41	414.71
6	2	0.14	0.18	0.31	0.13	135.10	177.31	126.09	1.48	1.13	1.59	182.18
7	2	0.13	0.16	0.28	0.11	126.09	157.61	113.48	1.59	1.27	1.76	162.40
8	2	0.12	0.42	0.54	0.10	118.21	420.30	103.16	1.69	0.48	1.94	133.64
9	3	0.13	0.31	0.45	0.28	133.93	312.50	281.25	1.49	0.64	0.71	1147.15
10	3	0.13	0.25	0.38	0.22	125.00	250.00	225.00	1.60	0.80	0.89	671.63
11	3	0.12	0.21	0.33	0.19	117.19	208.33	187.50	1.71	0.96	1.07	501.02
12	3	0.12	0.18	0.30	0.16	124.92	178.46	160.61	1.60	1.12	1.25	441.68
13	3	0.12	0.16	0.27	0.14	115.31	156.15	140.54	1.73	1.28	1.42	414.71
14	2	0.16	0.14	0.30	0.13	160.61	138.80	124.92	1.25	1.44	1.60	182.18
15	2	0.15	0.38	0.52	0.11	149.91	374.76	112.43	1.33	0.53	1.78	162.40
16	2	0.14	0.28	0.42	0.10	140.54	281.07	102.21	1.42	0.71	1.96	133.64
17	2	0.15	0.23	0.37	0.28	145.18	226.48	283.10	1.38	0.88	0.71	1147.15
18	2	0.13	0.19	0.32	0.23	134.81	188.74	226.48	1.48	1.06	0.88	671.63
19	2	0.13	0.16	0.29	0.19	125.82	161.77	188.74	1.59	1.24	1.06	501.02
20	2	0.12	0.14	0.26	0.16	117.96	141.55	161.77	1.70	1.41	1.24	441.68
21	2	0.12	0.13	0.25	0.14	124.38	125.77	141.49	1.61	1.59	1.41	414.71
22	2	0.12	0.34	0.46	0.13	115.50	343.00	125.77	1.73	0.58	1.59	182.18
23	2	0.11	0.26	0.37	0.11	107.80	257.25	113.19	1.86	0.78	1.77	162.40
24	2	0.10	0.21	0.31	0.10	101.06	205.80	102.90	1.98	0.97	1.94	133.64
25	3	0.12	0.17	0.29	0.28	115.50	170.62	281.52	1.73	1.17	0.71	1147.15
26	2	0.16	0.15	0.31	0.22	160.87	146.24	225.22	1.24	1.37	0.89	671.63
27	2	0.15	0.13	0.23	0.19	150.14	127.96	187.68	1.33	1.56	1.07	501.02
28	2	0.14	0.11	0.25	0.16	140.76	113.75	160.87	1.42	1.76	1.24	441.68
29	2	0.14	0.31	0.46	0.14	144.30	312.64	140.69	1.39	0.64	1.42	414.71
30	2	0.13	0.23	0.37	0.13	133.99	234.46	125.06	1.49	0.85	1.60	182.18
31	2	0.13	0.19	0.31	0.11	125.06	187.59	112.55	1.60	1.07	1.78	162.40
32	2	0.12	0.16	0.27	0.10	117.24	156.32	102.32	1.71	1.28	1.96	133.64
33	2	0.14	0.14	0.27	0.28	135.17	135.17	283.86	1.48	1.48	0.70	1147.15
34	2	0.12	0.12	0.24	0.23	124.77	118.28	227.09	1.60	1.69	0.88	671.63
35	2	0.12	0.10	0.22	0.19	115.86	105.13	189.24	1.73	1.90	1.06	501.02
36	2	0.11	0.29	0.40	0.16	108.14	291.14	162.21	1.85	0.69	1.23	441.68
37	2	0.10	0.22	0.32	0.14	101.38	218.35	141.93	1.97	0.92	1.41	414.71
38	2	0.12	0.17	0.29	0.13	118.21	174.59	126.09	1.69	1.15	1.59	182.18
39	2	0.11	0.14	0.25	0.11	109.12	145.49	113.49	1.83	1.38	1.76	162.40
40	2	0.10	0.13	0.23	0.10	101.33	124.71	103.17	1.97	1.60	1.94	133.64
41	2	0.09	0.11	0.20	0.28	94.57	109.12	283.71	2.11	1.83	0.70	1147.15
42	2	0.09	0.10	0.19	0.23	88.66	97.00	226.97	2.26	2.06	0.38	671.63
43	2	0.14	0.27	0.41	0.19	144.58	268.50	187.95	1.38	0.75	1.06	501.02
44	2	0.13	0.20	0.34	0.16	134.25	201.38	161.10	1.49	0.99	1.24	441.68
45	2	0.13	0.16	0.29	0.14	125.30	161.10	140.96	1.60	1.24	1.42	414.71
46	2	0.12	0.13	0.25	0.13	117.47	134.25	125.30	1.70	1.49	1.60	182.18
47	2	0.12	0.12	0.24	0.11	124.34	115.46	113.15	1.61	1.73	1.77	162.40
48	2	0.12	0.10	0.22	0.10	115.46	101.03	102.86	1.73	1.98	1.94	133.64
49	2	0.11	0.09	0.20	0.28	107.76	89.80	282.88	1.86	2.23	0.71	1147.15
50	2	0.10	0.25	0.35	0.23	101.03	251.45	226.30	1.98	0.80	0.88	671.63
51	2	0.11	0.19	0.30	0.19	108.75	188.50	188.50	1.84	1.06	1.06	501.02
52	2	0.10	0.15	0.25	0.16	100.98	150.80	161.57	1.98	1.33	1.24	441.68
53	2	0.09	0.13	0.22	0.14	94.25	125.67	141.38	2.12	1.59	1.41	414.71
54	2	0.09	0.11	0.20	0.13	88.36	107.71	125.67	2.26	1.86	1.59	182.18
55	2	0.12	0.09	0.21	0.11	116.49	95.14	114.16	1.72	2.10	1.75	162.40
56	2	0.11	0.09	0.19	0.10	108.73	84.56	103.78	1.84	2.37	1.93	133.64
57	2	0.10	0.24	0.34	0.28	101.93	237.84	285.40	1.96	0.84	0.70	1147.15
58	2	0.12	0.18	0.30	0.23	118.85	178.26	228.20	1.68	1.12	0.88	671.63
59	2	0.11	0.14	0.25	0.19	109.71	142.63	190.17	1.82	1.40	1.05	501.02
60	2	0.10	0.12	0.22	0.16	101.88	118.85	163.00	1.96	1.68	1.23	441.68
61	2	0.10	0.10	0.20	0.14	95.08	101.88	142.63	2.10	1.96	1.40	414.71
62	2	0.09	0.09	0.18	0.13	89.14	89.14	126.78	2.24	2.24	1.58	182.18
63	2	0.10	0.08	0.18	0.11	101.19	78.71	113.34	1.98	2.54	1.76	162.40
64	2	0.09	0.22	0.32	0.10	94.45	222.23	103.03	2.12	0.90	1.94	133.64
65	2	0.09	0.17	0.26	0.28	88.55	166.07	283.35	2.26	1.20	0.71	1147.15
66	2	0.10	0.13	0.23	0.23	101.02	133.10	226.28	1.98	1.50	0.88	671.63
67	2	0.09	0.11	0.21	0.19	94.28	110.92	188.56	2.12	1.80	1.06	501.02
68	2	0.09	0.09	0.18	0.16	88.39	95.07	161.63	2.26	2.10	1.24	441.68
69	2	0.09	0.09	0.18	0.15	91.15	85.79	145.83	2.19	2.33	1.37	420.11

Tr = Tractors

\+ Plough work rate for tractor fleet

* Cult.=cultivator; work rate only using one tractor

@ Drill work rate only using one tractor.

Table 6a Performance of 4-WD tractors (unequal) and utilisation of multiple combinations selected for a 300 ha, operation starting at day no. 260 (week 38) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Set no.	No. of tr	Proportional use				Operation use			Performance			Yield loss value ($)
		Ploughing	Cultivation	Tillage	Drilling	Ploughing (h)	Cultivation (h)	Drilling (h)	Plough work rate+ (ha/h)	Cult. work rate* (ha/h)	Drill work rate@ (ha/h)	
1	3	0.17	0.71	0.88	0.43	174.68	709.65	425.79	1.72	0.42	0.70	3741.82
2	3	0.16	0.53	0.69	0.34	162.21	532.23	340.63	1.85	0.56	0.88	2305.97
3	3	0.15	0.43	0.58	0.28	151.39	425.79	283.86	1.98	0.70	1.06	1720.72
4	2	0.21	0.35	0.57	0.24	212.89	354.82	243.31	1.41	0.85	1.23	1464.51
5	2	0.22	0.30	0.52	0.21	218.23	303.97	212.78	1.37	0.99	1.41	889.08
6	2	0.20	0.27	0.47	0.19	202.64	265.97	189.13	1.48	1.13	1.59	751.53
7	2	0.19	0.24	0.43	0.17	189.13	236.42	170.22	1.59	1.27	1.76	686.80
8	2	0.18	0.63	0.81	0.16	177.31	630.45	154.75	1.69	0.48	1.94	643.66
9	3	0.20	0.47	0.67	0.42	200.69	468.75	421.88	1.49	0.64	0.71	3620.45
10	3	0.19	0.38	0.56	0.34	187.50	375.00	337.50	1.60	0.80	0.89	2305.97
11	3	0.18	0.31	0.49	0.28	175.78	312.50	281.25	1.71	0.96	1.07	1720.72
12	3	0.19	0.27	0.46	0.24	187.38	267.69	240.92	1.60	1.12	1.25	1464.51
13	3	0.17	0.23	0.41	0.21	172.97	234.23	210.80	1.73	1.28	1.42	889.08
14	3	0.16	0.21	0.37	0.19	160.61	208.20	187.38	1.87	1.44	1.60	751.53
15	3	0.15	0.56	0.71	0.17	149.91	562.15	168.64	2.00	0.53	1.78	686.80
16	2	0.21	0.42	0.63	0.15	210.80	421.61	153.31	1.42	0.71	1.96	643.66
17	2	0.22	0.34	0.56	0.43	217.77	339.72	424.65	1.38	0.88	0.71	3741.82
18	2	0.20	0.29	0.49	0.34	202.22	283.10	339.72	1.48	1.06	0.88	2305.97
19	2	0.19	0.24	0.43	0.28	188.74	242.66	283.10	1.59	1.24	1.06	1720.72
20	2	0.18	0.21	0.39	0.24	176.94	212.33	242.66	1.70	1.41	1.24	1464.51
21	2	0.19	0.19	0.38	0.21	186.58	188.65	212.23	1.61	1.59	1.41	889.08
22	2	0.17	0.51	0.69	0.19	173.25	514.50	188.65	1.73	0.58	1.59	751.53
23	2	0.16	0.39	0.55	0.17	161.70	385.87	169.78	1.86	0.78	1.77	686.80
24	2	0.15	0.31	0.46	0.15	151.59	308.70	154.35	1.98	0.97	1.94	643.66
25	3	0.17	0.26	0.43	0.42	173.24	255.93	422.28	1.73	1.17	0.71	3620.45
26	3	0.16	0.22	0.38	0.34	160.87	219.37	337.82	1.86	1.37	0.89	2305.97
27	3	0.15	0.19	0.34	0.28	150.14	191.95	281.52	2.00	1.56	1.07	1720.72
28	2	0.21	0.17	0.38	0.24	211.14	170.62	241.30	1.42	1.76	1.24	1464.51
29	2	0.22	0.47	0.69	0.21	216.44	468.96	211.03	1.39	0.64	1.42	889.08
30	2	0.20	0.35	0.55	0.19	200.98	351.72	187.58	1.49	0.85	1.60	751.53
31	2	0.19	0.28	0.47	0.17	187.58	281.38	168.83	1.60	1.07	1.78	686.80
32	2	0.18	0.23	0.41	0.15	175.86	234.48	153.48	1.71	1.28	1.96	643.66
33	2	0.20	0.20	0.41	0.43	202.76	202.76	425.79	1.48	1.48	0.70	3741.82
34	2	0.19	0.18	0.36	0.34	187.16	177.41	340.63	1.60	1.69	0.88	2305.97
35	2	0.17	0.16	0.33	0.28	173.79	157.70	283.86	1.73	1.90	1.06	1720.72
36	2	0.16	0.44	0.60	0.24	162.21	436.71	243.31	1.85	0.69	1.23	1464.51
37	2	0.15	0.33	0.48	0.21	152.07	327.53	212.90	1.97	0.92	1.41	889.08
38	2	0.18	0.26	0.44	0.19	177.32	261.89	189.14	1.69	1.15	1.59	751.53
39	2	0.16	0.22	0.38	0.17	163.68	218.24	170.23	1.83	1.38	1.76	686.80
40	2	0.15	0.19	0.34	0.16	151.99	187.06	154.75	1.97	1.60	1.94	643.66
41	2	0.14	0.16	0.31	0.43	141.86	163.66	425.57	2.11	1.83	0.70	3741.82
42	2	0.13	0.14	0.28	0.34	132.99	145.49	340.46	2.26	2.06	0.88	2305.97
43	2	0.22	0.40	0.62	0.28	216.87	402.75	281.93	1.38	0.75	1.06	1720.72
44	2	0.20	0.30	0.50	0.24	201.38	302.06	241.65	1.49	0.99	1.24	1464.51
45	2	0.19	0.24	0.43	0.21	187.95	241.65	211.44	1.60	1.24	1.42	889.08
46	2	0.18	0.20	0.38	0.19	176.20	201.36	187.95	1.70	1.49	1.60	751.53
47	2	0.19	0.17	0.36	0.17	186.51	173.19	169.73	1.61	1.73	1.77	686.80
48	2	0.17	0.15	0.32	0.15	173.19	151.54	154.30	1.73	1.98	1.94	643.66
49	2	0.16	0.14	0.30	0.42	161.64	134.70	424.31	1.86	2.23	0.71	3741.82
50	2	0.15	0.38	0.53	0.34	151.54	377.17	339.45	1.98	0.80	0.88	2305.97
51	2	0.16	0.28	0.45	0.28	163.13	282.75	282.75	1.84	1.06	1.06	1720.72
52	2	0.15	0.23	0.38	0.24	151.47	226.20	242.36	1.98	1.33	1.24	1464.51
53	2	0.14	0.19	0.33	0.21	141.38	188.50	212.06	2.12	1.59	1.41	889.08
54	2	0.13	0.16	0.29	0.19	132.54	161.57	188.50	2.26	1.86	1.59	751.53
55	2	0.17	0.14	0.32	0.17	174.74	142.70	171.24	1.72	2.10	1.75	686.00
56	2	0.16	0.13	0.29	0.16	163.09	126.85	155.68	1.84	2.37	1.93	643.66
57	2	0.15	0.36	0.51	0.43	152.90	356.76	428.11	1.96	0.84	0.70	3741.02
58	2	0.18	0.27	0.45	0.34	178.28	267.42	342.30	1.68	1.12	0.88	2305.97
59	2	0.16	0.21	0.38	0.28	164.57	213.94	285.25	1.82	1.40	1.05	1720.72
60	2	0.15	0.18	0.33	0.25	152.81	178.28	244.50	1.96	1.68	1.23	1464.51
61	2	0.14	0.15	0.30	0.21	142.63	152.81	213.94	2.10	1.96	1.40	889.08
62	2	0.13	0.13	0.27	0.19	133.71	133.71	190.17	2.24	2.24	1.53	751.53
63	2	0.15	0.12	0.27	0.17	151.79	118.06	170.01	1.98	2.54	1.76	686.80
64	2	0.14	0.33	0.48	0.16	141.07	333.35	154.55	2.12	0.90	1.94	643.66
65	2	0.13	0.25	0.38	0.43	132.82	250.01	425.02	2.26	1.20	0.71	3741.82
66	2	0.15	0.20	0.35	0.34	151.52	199.65	339.41	1.98	1.50	0.83	2305.97
67	2	0.14	0.17	0.31	0.28	141.42	166.38	282.84	2.12	1.33	1.06	1720.72
68	2	0.13	0.14	0.28	0.24	132.58	142.61	242.44	2.26	2.10	1.24	1464.51
69	2	0.14	0.13	0.27	0.22	136.72	128.66	218.75	2.19	2.33	1.37	945.73

Tr = Tractors
+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
@ Drill work rate only using one tractor.

Table 7a 4-WD tractor (unequal) costs in different operations for a period of ownership of 5 years.

Ref no.	Power (kW)	Purchase price ($)	Tractor present cost: Ploughing ($)	Tractor present cost: Cultivation ($)	Tractor present cost: Drilling ($)	Tractor repair cost: Ploughing ($)	Tractor repair cost: Cultivation ($)	Tractor repair cost: Drilling ($)	Insurance cost ($)	Tax cost ($)	Shelter cost ($)
1	63	16667.90	334.4	1358.5	815.1	285.8	1161.2	696.7	105.8	15.0	166.7
2	68	17986.95	502.4	1099.0	703.4	429.6	939.8	601.5	111.6	15.0	179.9
3	73	19306.00	503.1	943.3	628.9	430.4	807.0	532.0	117.3	15.0	193.1
4	78	20625.05	503.7	839.5	575.6	431.0	718.4	492.6	123.1	15.0	206.3
5	63	16667.90	417.8	581.9	407.3	357.1	497.4	348.2	105.8	15.0	166.7
6	68	17986.95	418.4	549.2	390.5	357.8	469.6	334.0	111.6	15.0	179.9
7	73	19306.00	419.0	523.8	377.1	358.5	448.1	322.6	117.3	15.0	193.1
8	77	20301.24	414.2	1472.6	361.5	354.4	1260.2	309.3	122.0	15.0	203.6
9	55	14821.23	342.2	798.5	718.7	292.3	682.0	613.8	97.6	15.0	148.2
10	60	15876.47	342.0	684.0	615.6	292.2	584.5	526.0	102.3	15.0	158.8
11	64	16931.71	341.8	607.6	546.9	292.2	519.4	467.5	106.9	15.0	169.3
12	43	12710.75	274.1	391.5	352.4	233.8	334.0	300.6	87.1	15.0	127.1
13	52	13765.99	273.8	370.8	333.7	233.8	316.5	284.9	93.0	15.0	137.7
14	56	14821.23	410.4	354.7	319.2	350.5	302.9	272.6	97.6	15.0	148.2
15	60	15876.47	410.1	1025.3	307.6	350.5	876.1	262.8	102.3	15.0	158.8
16	64	16931.71	409.9	819.8	298.1	350.4	700.8	254.8	106.9	15.0	169.3
17	73	19306.00	432.5	752.6	940.8	412.7	643.9	804.8	117.3	15.0	193.1
18	79	20888.86	484.5	678.3	814.0	414.7	580.5	696.6	124.3	15.0	208.9
19	85	22471.72	486.3	625.2	729.4	416.4	535.3	624.5	131.3	15.0	224.7
20	90	23790.77	482.5	579.0	661.7	413.2	495.9	565.7	137.0	15.0	237.9
21	73	19306.00	413.3	417.9	470.2	353.6	357.5	402.2	117.3	15.0	193.1
22	79	20888.86	415.1	1232.7	452.0	355.3	1055.0	386.8	124.3	15.0	208.9
23	85	22471.72	416.6	994.2	437.5	356.7	851.2	374.5	131.3	15.0	224.7
24	90	23790.77	413.4	841.8	420.9	354.0	721.0	360.5	137.0	15.0	237.9
25	65	17195.52	342.1	505.3	833.8	292.5	432.0	712.8	108.1	15.0	172.0
26	70	18514.57	512.8	466.2	717.9	438.6	398.7	614.0	113.9	15.0	185.1
27	75	19833.62	512.5	436.8	640.6	438.5	373.7	548.1	119.7	15.0	198.3
28	80	21152.67	512.2	413.9	585.4	438.4	354.3	501.1	125.4	15.0	211.5
29	65	17195.52	427.4	926.0	416.7	365.4	791.6	355.2	108.1	15.0	172.0
30	70	18514.57	427.1	747.4	398.6	365.3	639.3	340.9	113.9	15.0	185.1
31	75	19833.62	426.9	640.3	384.2	365.2	547.9	328.7	119.7	15.0	198.3
32	80	21152.67	426.6	568.9	372.3	365.2	486.9	318.7	125.4	15.0	211.5
33	78	20625.05	479.7	479.7	1007.4	410.5	410.5	862.1	123.1	15.0	206.3
34	85	22471.72	482.2	457.1	877.6	412.9	391.4	751.4	131.3	15.0	224.7
35	92	24318.39	484.4	439.5	791.1	414.9	376.5	677.7	139.4	15.0	243.2
36	98	25901.25	481.4	1295.9	722.0	412.4	1110.4	618.7	146.3	15.0	259.0
37	105	27747.92	483.3	1040.9	676.6	414.2	892.2	579.9	154.4	15.0	277.5
38	78	20625.05	419.3	619.6	447.5	359.0	530.3	383.0	123.1	15.0	206.3
39	85	22471.72	421.7	562.3	438.6	361.1	481.4	375.5	131.3	15.0	224.7
40	91	24054.58	419.0	515.7	426.6	358.9	441.7	365.4	138.2	15.0	240.6
41	98	25901.25	421.0	485.7	1262.9	360.7	416.2	1082.1	146.3	15.0	259.0
42	105	27747.92	422.6	462.4	1082.0	362.3	396.3	927.4	154.4	15.0	277.5
43	68	17986.95	447.8	831.6	582.1	382.9	711.2	497.8	111.6	15.0	179.9
44	74	19569.81	452.2	678.3	542.6	386.9	580.3	464.2	118.5	15.0	195.7
45	79	20888.86	450.3	579.0	506.6	385.4	495.5	433.6	124.3	15.0	208.9
46	84	22207.91	448.7	512.8	478.6	384.1	439.0	409.8	130.1	15.0	222.1
47	90	23790.77	508.6	472.3	462.8	435.6	404.5	396.4	137.0	15.0	237.9
48	97	25637.44	503.7	445.1	453.2	435.9	381.4	388.3	145.1	15.0	256.4
49	104	27484.11	508.8	424.0	1335.7	436.1	363.4	1144.8	153.3	15.0	274.8
50	111	29330.78	508.9	1266.7	1140.0	436.3	1086.0	977.4	161.4	15.0	293.3
51	90	23790.77	444.8	771.0	771.0	381.0	660.4	660.4	137.0	15.0	237.9
52	97	25637.44	445.0	664.5	711.9	381.2	569.3	610.0	145.1	15.0	256.4
53	104	27484.11	445.0	593.4	667.6	381.4	508.6	572.2	153.3	15.0	274.8
54	111	29330.78	445.1	542.6	633.1	381.6	465.2	542.8	161.4	15.0	293.3
55	103	27220.30	544.8	444.9	533.9	466.9	381.3	457.6	152.1	15.0	272.2
56	110	29066.97	542.8	422.2	518.1	465.4	362.0	444.2	160.2	15.0	290.7
57	117	30913.64	541.1	1262.5	1515.0	464.0	1082.7	1297.2	168.3	15.0	309.1
58	88	23263.15	475.4	713.2	912.8	407.1	610.7	781.7	134.7	15.0	232.6
59	95	25109.82	473.5	615.6	820.7	405.7	527.4	703.1	142.8	15.0	251.1
60	103	27220.30	470.5	555.9	762.3	408.3	476.4	653.3	152.1	15.0	272.2
61	110	29066.97	474.7	508.6	712.1	407.0	436.0	610.5	160.2	15.0	290.7
62	117	30913.64	473.2	473.2	673.0	405.8	405.8	577.1	168.3	15.0	309.1
63	116	30649.83	532.6	414.2	596.5	456.7	355.2	511.5	167.2	15.0	306.5
64	124	32760.31	531.7	1249.8	579.4	455.6	1072.1	497.0	176.4	15.0	327.6
65	132	34870.79	529.9	997.5	1095.7	454.7	855.8	1454.9	185.7	15.0	348.7
66	114	30122.21	522.5	688.5	1170.5	448.1	590.4	1003.7	164.9	15.0	301.2
67	122	32232.69	521.7	613.8	1043.4	447.5	526.5	895.0	174.1	15.0	322.3
68	131	34606.98	525.0	564.7	960.0	450.4	484.5	823.6	164.6	15.0	346.1
69	145	38300.32	598.9	563.7	958.2	514.0	483.8	822.5	200.8	15.0	383.0

APPENDIX 3 cont'd

Table 3o Feasible 4-WD tractor (unequal)-plough combinations for ploughing a 100 ha operation starting at week 39 and expected to finish at week 40, at 80% field efficiency (soil series Vinton).

Single combination no. / number tractors	26 / 2	27 / 2	70 / 2	71 / 2	306 / 2	306 / 2	421 / 2	42[illegible] / 1
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	103	110
P.T.O. power (kW)	63.71	67.95	49.18	52.70	73.80	78.60	89.70	96.11
drawbar power (kW)	42.52	45.35	33.94	36.37	50.49	53.13	58.68	62.67
static weight (kN)	50.26	50.26	41.47	41.47	53.78	71.61	75.67	75.67
dynamic weight (kN)	57.59	57.59	47.34	47.34	62.56	81.84	85.90	85.90
weight/power (kg/kW)	80.20	75.18	85.39	79.70	75.21	92.37	84.95	79.29
dynamic axle load								
front (kN)	23.74	23.74	19.75	19.75	25.92	35.09	37.97	37.97
rear (kN)	33.85	33.85	27.60	27.60	36.64	46.75	47.93	47.93
front tyre dimension (in)	11.2-28.0	11.2-28.0	11.1-28.0	11.1-28.0	12.4-28.0	13.6-28.0	12.4-28.0	12.4-28.0
rear tyre dimension (in)	16.9-34.0	16.9-34.0	12.4-28.0	12.4-28.0	16.9-38.0	18.4-38.0	15.5-38.0	15.5-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.00
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.00
wheel slip (%)	11.93	11.93	11.11	11.11	11.32	11.62	12.40	12.41
actual thrust (kN)	23.17	23.17	19.64	19.64	25.62	33.29	34.45	34.45
front rolling res. (kN)	1.34	1.34	1.00	1.00	1.36	1.96	2.48	2.47
rear rolling res. (kN)	1.25	1.25	0.84	0.84	1.10	1.53	1.68	1.67
maximum thrust (kN)	38.31	38.31	33.35	33.35	43.47	55.62	55.18	55.11
Plough specification:								
bodies	5	5	4	4	6	7	7	7
weight (kN)	7.33	7.33	5.88	5.88	8.78	10.23	10.23	10.23
forward speed (km/h)	6.61	7.05	6.22	6.67	7.09	5.74	6.13	[illegible]
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.2[illegible]
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.2[illegible]
actual work rate (ha/h)	0.66	0.70	0.50	0.53	0.85	0.80	0.86	0.9[illegible]
draught (kN)	18.87	19.17	14.90	15.13	23.04	25.68	25.99	25.[illegible]
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.0[illegible]
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.336[illegible]
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.0[illegible]
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.1[illegible]
workability (% of FC)	110	110	110	110	110	110	110	11[illegible]
probability level (%)	90	90	90	90	90	90	90	[illegible]
Operating condition								
plough start day no	267	267	267	267	267	267	267	26[illegible]
no. of ploughing days	9	8	12	11	7	7	7	1[illegible]
expected finish day no	280	280	280	280	280	280	280	28[illegible]
plough finish day no	280	280	280	280	280	280	280	28[illegible]
plough penalty days	0	0	0	0	0	0	0	[illegible]
plough finish week no	40	40	40	40	39	39	39	4[illegible]
Operational costs ($)								
tractor purchase price	19306.00	20625.05	14821.23	15876.47	22207.91	23790.77	27220.30	29066.9[illegible]
plough purchase price	2308.46	2308.46	1815.49	1815.49	2801.42	3294.38	3294.38	3294.3[illegible]
tractor annual cost	3323.12	3548.79	2555.32	2735.98	3819.60	4090.36	4676.80	4992.51
plough annual cost	306.55	306.55	244.03	244.03	369.71	433.16	433.16	466.3[illegible]
tractor ann. cost/plough	251.55	251.84	256.67	256.50	224.34	254.30	272.40	542.81
fuel cost	597.67	597.59	615.66	614.54	540.75	607.75	651.55	1300.6[illegible]
labour cost	378.48	354.82	502.23	468.75	293.67	310.85	291.23	543.6[illegible]
other operating cost	79.62	79.43	76.26	75.94	81.96	92.35	93.69	113.7[illegible]
single combination cost ($)	1613.87	1590.24	1694.86	1659.76	1510.44	1698.42	1742.04	2972.1[illegible]
Total ploughing cost ($)	3227.7	3180.5	3389.7	3319.5	3020.9	3396.8	3484.1	2972.[illegible]

APPENDIX 3 cont'd

Table 9a Feasible 4-WD tractor (unequal)-plough combinations for ploughing a 200 ha operation starting at week 39 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	26	27	70	71	306	366	421	422
Number tractors	2	2	3	3	2	2	2	2
Tractor specifications:								
max. power required (kW)	73	78	56	60	84	90	103	110
P.T.O. power (kW)	63.71	67.95	49.18	52.70	73.80	78.60	89.70	96.11
drawbar power (kW)	42.52	45.35	33.94	36.37	50.49	53.13	58.68	62.87
static weight (kN)	50.26	50.26	41.47	41.47	53.78	71.61	75.67	75.67
dynamic weight (kN)	57.59	57.59	47.34	47.34	62.56	81.54	85.90	85.90
weight/power (kg/kW)	80.20	75.18	85.39	79.70	75.21	92.37	84.95	79.29
dynamic axle load								
front (kN)	23.74	23.74	19.75	19.75	25.92	35.09	37.97	37.97
rear (kN)	33.85	33.85	27.60	27.60	36.64	46.75	47.93	47.93
front tyre dimension (in)	11.2-28.0	11.2-28.0	11.1-28.0	11.1-28.0	12.4-28.0	13.6-28.0	12.4-28.0	12.4-28.0
rear tyre dimension (in)	16.9-34.0	16.9-34.0	12.4-28.0	12.4-28.0	16.9-38.0	18.4-38.0	15.5-38.0	15.5-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.00
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.00
wheel slip (%)	11.93	11.93	11.11	11.11	11.32	11.62	12.40	12.41
actual thrust (kN)	23.17	23.17	19.64	19.64	25.62	33.29	34.45	34.41
front rolling res. (kN)	1.34	1.34	1.00	1.00	1.36	1.96	2.48	2.47
rear rolling res. (kN)	1.25	1.25	0.84	0.84	1.10	1.53	1.68	1.68
maximum thrust (kN)	38.31	38.31	33.35	33.35	43.47	55.62	55.18	55.11
Plough specifications:								
bodies	5	5	4	4	6	7	7	7
weight (kN)	7.33	7.33	5.88	5.88	5.78	10.23	10.23	10.23
forward speed (km/h)	6.61	7.05	6.22	6.67	7.09	5.74	6.13	6.57
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.66	0.70	0.50	0.53	0.85	0.80	0.86	0.92
draught (kN)	18.87	19.17	14.90	15.13	23.04	25.68	25.99	26.38
Soil specifications:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	267	267	267	267	267	267	267	267
no. of ploughing days	18	17	16	15	14	15	14	13
expected finish day no	287	287	287	287	287	287	287	287
plough finish day no	287	287	287	287	287	287	287	287
plough penalty days	0	0	0	0	0		0	0
plough finish week no	41	41	41	41	40	41	40	40
Operational costs: ($)								
tractor purchase price	19306.00	20625.05	14821.23	15876.47	22207.91	23790.77	27220.30	29066.97
plough purchase price	2308.46	2308.46	1815.49	1815.49	2801.42	3294.38	3294.38	3294.38
tractor annual cost	3323.12	3548.79	2555.32	2735.98	3819.60	4090.36	4676.80	4992.51
plough annual cost	329.81	329.81	249.02	249.02	397.93	466.35	466.35	466.35
tractor ann. cost/plough	503.09	503.68	342.23	342.00	448.69	508.60	544.81	542.81
fuel cost	1195.34	1195.19	820.88	819.39	1081.51	1215.51	1303.10	1300.64
labour cost	756.96	709.65	669.64	625.00	587.35	621.70	582.46	543.63
other operating cost	104.25	103.87	85.00	84.57	103.53	116.59	119.28	118.76
Single combination cost ($)	2809.45	2842.20	2166.77	2119.97	2619.00	2928.75	3016.00	2972.19
Total ploughing cost ($)	5773.9	5684.4	6500.3	6359.9	5238.0	5857.5	6032.0	5944.4

APPENDIX 3 cont'd

Table 10b Feasible 4-WD tractor (unequal)-plough combinations for ploughing a 300 ha operations starting at week 38 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	26	27	70	71	306	366	421	422
Number tractors	3	2	3	3	2	2	2	2
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	103	111
P.T.O. power (kW)	63.71	67.95	49.18	52.70	73.80	78.60	89.70	96.11
drawbar power (kW)	42.52	45.35	33.94	36.37	50.49	53.13	55.68	62.87
static weight (kN)	50.26	50.26	41.47	41.47	53.78	71.61	75.67	75.67
dynamic weight (kN)	57.59	57.59	47.34	47.34	62.56	81.84	85.90	85.90
weight/power (kg/kW)	80.20	75.18	85.39	79.70	75.21	92.37	84.95	79.29
dynamic axle load								
front (kN)	23.74	23.74	19.75	19.75	25.92	35.09	37.97	37.97
rear (kN)	33.85	33.85	27.60	27.60	36.64	46.75	47.93	47.93
front tyre dimension (in)	11.2-28.0	11.2-28.0	11.1-28.0	11.1-28.0	12.4-28.0	13.6-28.0	12.4-28.0	12.4-28.0
rear tyre dimension (in)	16.9-34.0	16.9-34.0	12.4-28.0	12.4-28.0	16.9-38.0	16.4-38.0	15.5-38.0	15.5-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.0
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	80.00	130.00	110.00	110.0
wheel slip (%)	11.93	11.93	11.11	11.11	11.32	11.62	12.40	12.41
actual thrust (kN)	23.17	23.17	19.64	19.64	25.62	33.29	34.45	34.4
front rolling res. (kN)	1.34	1.34	1.00	1.00	1.36	1.96	2.48	2.4
rear rolling res. (kN)	1.25	1.25	0.84	0.84	1.10	1.53	1.68	1.6
maximum thrust (kN)	38.31	38.31	33.35	33.35	43.47	55.62	55.18	55.1
Plough specification:								
bodies	5	5	4	4	6	7	7	7
weight (kN)	7.33	7.33	5.88	5.88	8.78	10.23	10.23	10.23
forward speed (km/h)	6.61	7.05	6.22	6.67	7.09	5.74	6.13	6.57
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.66	0.70	0.50	0.53	0.85	0.80	0.86	0.92
draught (kN)	18.87	19.17	14.90	15.13	23.04	25.68	25.99	26.31
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%d/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	260	260	260	260	260	260	260	260
no. of ploughing days	18	26	25	23	22	23	21	21
expected finish day no	287	287	287	287	287	237	287	287
plough finish day no	287	287	287	287	287	287	287	287
plough penalty days	0	0	0	0	0	0	0	[illegible]
plough finish week no	40	41	41	41	41	41	40	4[illegible]
Operational costs: ($)								
tractor purchase price	19306.00	20625.05	14821.23	15876.47	22207.91	23790.77	27220.30	29066.97
plough purchase price	2308.46	2308.46	1815.49	1815.49	2801.42	3294.38	3294.38	3294.38
tractor annual cost	3323.12	3548.79	2555.32	2735.98	3819.60	4090.36	4676.80	4992.51
plough annual cost	329.81	365.05	262.32	262.32	440.69	516.64	516.64	516.64
tractor ann. cost/plough	503.09	755.52	513.35	513.06	673.03	762.90	817.21	814.2
fuel cost	1195.34	1792.78	1231.32	1229.09	1622.26	1823.26	1954.65	1950.94
labour cost	756.96	1064.47	1004.46	937.50	881.02	932.56	873.69	815.44
other operating cost	104.25	128.31	102.47	101.82	125.09	140.84	144.87	144.09
Single combination cost($)	2889.45	4106.13	3113.92	3043.73	3742.10	4176.20	4307.06	4241.3
Total ploughing cost ($)	8668.4	8212.3	9341.8	9131.2	7484.2	8352.4	8614.1	8452.7

APPENDIX 3 cont'd

Table 11a Feasible 4-WD tractor (unequal)-cultivator combinations for cultivating a 100 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	26	27	70	71	305	306	421	422
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	103	110
Cultivator specification:								
no. of (blades/tines)/m	25	25	25	25	25	25	25	25
width (m)	2.500	3.000	2.000	2.500	3.000	3.500	4.000	4.500
actual speed (km/h)	3.52	3.52	4.00	4.00	6.21	6.19	6.57	6.57
actual work rate (ha/h)	0.70	0.85	0.64	0.80	1.49	1.73	2.10	2.37
Operating condition:								
start week no	41	41	41	41	40	40	40	41
start day no	281	281	281	281	274	274	274	281
nr. of cult. days reqrd	17	14	19	15	8	7	5	5
expected finish day no	297	294	299	295	281	280	278	285
available work days	21	14	21	21	14	7	7	7
actual finish day no	297	294	299	295	281	280	278	285
non work days	0	0	0	0	0	0	0	0
actual finish week no	43	42	43	43	41	40	40	41
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	2398.23	2975.60	1851.06	2398.23	2975.60	3522.17	4097.54	4646.11
salvage value	997.02	1237.05	769.80	997.02	1237.05	1464.28	1704.31	1931.54
repair cost	11.51	14.29	8.89	11.51	14.29	16.91	19.68	22.31
present annual cost.	313.01	385.94	244.73	313.01	385.94	455.16	528.28	597.50
annual cash flow	264.68	323.40	204.36	264.68	328.40	388.72	452.44	512.76
insurance ($/yr)	31.91	33.37	31.91	31.91	33.37	36.45	39.70	42.78
shelter ($/yr)	23.98	29.76	18.52	23.98	29.76	35.22	41.00	46.46
fuel cost	1120.63	995.99	957.70	819.39	618.01	564.34	532.10	505.80
labour cost	709.65	591.37	781.25	625.00	335.63	288.05	237.84	211.41
* Tractor ann.cost/cult.	471.65	419.73	399.27	342.00	256.39	236.14	222.46	211.09
Cultivation cost ($)	2717.01	2496.89	2474.13	2189.80	1683.73	1638.47	1622.28	1634.75

Table 12a Feasible 4-WD tractor (unequal)-cultivator combinations for cultivating a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		26	27	70	71	306	366	421	422
Tractor specification:									
max. power required	(kW)	73	78	56	60	84	90	103	110
Cultivator specification:									
no. of (blades/tines)/m		25	25	25	25	25	25	25	25
width	(m)	2.500	3.000	2.000	2.500	3.000	3.500	4.000	4.500
actual speed	(km/h)	3.52	3.52	4.00	4.00	6.21	6.19	6.57	6.57
actual work rate	(ha/h)	0.70	0.85	0.64	0.80	1.49	1.73	2.10	2.37
Operating condition:									
start week no		42	42	42	42	41	42	41	41
start day no		288	288	288	288	281	288	281	281
no. of cult. days reqrd		35	29	39	31	16	14	11	10
expected finish day no		322	316	326	318	296	301	291	290
available work days		35	35	42	35	21	14	14	14
actual finish day no		322	316	326	318	296	301	291	290
non work days		0	0	0	0	0	0	0	0
actual finish week no		46	46	47	46	43	43	42	42
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		2396.23	2975.60	1851.06	2398.23	2975.60	3522.17	4099.54	4646.11
salvage value		997.02	1237.05	769.80	997.02	1237.05	1464.23	1704.31	1931.54
repair cost		30.39	37.70	23.46	30.39	37.70	44.63	51.94	58.87
present annual cost		320.64	395.41	250.62	320.64	395.41	466.37	541.32	612.23
annual cash flow		264.68	328.40	204.36	264.68	328.40	388.72	452.44	512.76
insurance	($/yr)	31.91	33.37	31.91	31.91	33.37	36.45	39.70	42.78
shelter	($/yr)	23.98	29.76	18.52	23.98	29.76	35.22	41.00	46.46
fuel cost		2241.26	1991.98	1915.39	1636.78	1236.01	1128.69	1064.20	1011.61
labour cost		1419.29	1182.74	1562.50	1250.00	671.25	577.30	475.67	422.82
* Tractor ann.cost/cult.		943.30	839.46	798.54	684.00	512.78	472.27	444.93	422.19
Cultivation cost	($)	5072.75	4554.18	4658.99	4018.32	2927.87	2761.31	2645.61	2597.54

Table 13a Feasible 4-WD tractor (unequal)-cultivator combinations for cultivating a 300 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	26	27	70	71	306	366	421	422
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	103	110
Cultivator specification:								
no. of (blades/tines)/m	25	25	25	25	25	25	25	25
width (m)	2.500	3.000	2.000	2.500	3.000	3.500	4.000	4.500
actual speed (km/h)	3.52	3.52	4.00	4.00	6.21	6.19	6.57	6.57
actual work rate (ha/h)	0.70	0.85	0.64	0.80	1.49	1.73	2.10	2.37
Operating condition:								
start week no	41	42	42	42	42	42	41	41
start day no	281	288	288	288	288	288	281	281
no. of cult. days reqrd	53	44	58	46	25	21	17	15
expected finish day no	333	331	345	333	312	308	297	295
available work days	56	49	63	49	28	21	21	21
actual finish day no	333	331	345	333	312	308	297	295
non work days	0	0	0	0	0	0	0	0
actual finish week no	48	48	50	48	45	44	43	43
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	2398.23	2975.60	1851.66	2398.23	2975.60	3522.17	4099.54	4640.11
salvage value	997.02	1237.05	769.80	997.02	1237.05	1464.28	1704.31	1931.54
repair cost	53.61	66.51	41.39	53.61	66.51	78.73	91.63	103.85
present annual cost.	330.03	407.05	257.87	330.03	407.05	480.15	557.37	630.47
annual cash flow	264.68	328.40	204.36	264.68	328.40	388.72	452.44	512.76
insurance ($/yr)	31.91	33.37	31.91	31.91	33.37	36.45	39.70	42.78
shelter ($/yr)	23.98	29.76	18.52	23.98	29.76	35.22	41.00	46.46
fuel cost	3361.90	2987.97	2873.09	2455.18	1854.02	1693.03	1596.30	1517.41
labour cost	2128.94	1774.12	2343.75	1875.00	1006.88	865.94	713.51	634.23
* Tractor ann.cost/cult.	1414.94	1259.20	1197.81	1025.99	769.17	708.41	667.39	633.28
Cultivation cost ($)	7430.25	6013.66	6845.21	5848.61	4174.18	3886.74	3677.95	3563.73

APPENDIX 3 cont'd

Table 14a Feasible 4-WD tractor (unequal)-drill combinations for drilling a 100 ha at 80% field efficiency, a soil workablitiy criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	26	27	70	71	305	306	422	421
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	110	103
Drill specification:								
coulter width (m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters	30	35	20	25	45	50	55	50
width (m)	3.000	3.500	2.000	2.500	4.500	5.000	5.500	5.000
actual speed (km/h)	4.40	4.40	4.44	4.44	4.43	4.42	4.38	4.38
actual work rate (ha/h)	1.06	1.23	0.71	0.89	1.60	1.77	1.93	1.75
Operating condition:								
start week no	42	42	41	42	42	42	42	42
start day no	288	288	281	288	288	288	288	288
no. of drilling days	11	10	17	14	7	7	6	7
optimum day no	296	296	296	296	296	296	296	296
expected finish day no	298	297	297	301	294	294	293	294
available work days	14	14	21	14	7	7	7	7
non work days	0	0	0	0	0	0	0	0
actual finish day no	298	297	297	301	294	294	293	294
actual finish week no	43	43	43	43	42	42	42	42
average early loss (%)	0.0947	0.0947	0.3330	0.0947	0.0947	0.0947	0.0947	0.0947
average late loss (%)	0.0058	0.0014	0.0014	0.0362	0.0000	0.0000	0.0000	0.0000
average crop loss (%)	0.1005	0.0962	0.3344	0.1310	0.0947	0.0947	0.0947	0.0947
average crop yield(t/ha)	6.1938	6.1940	6.1793	6.1919	6.1941	6.1941	6.1941	6.1941
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	2471.47	3253.27	907.87	1689.67	4816.87	5598.67	6380.47	5598.67
salvage value	1027.47	1352.49	377.43	702.45	2002.53	2327.55	2652.57	2327.55
repair cost	20.17	26.55	7.41	13.79	39.30	45.68	52.06	45.68
present annual cost	322.28	421.16	128.83	224.72	619.21	718.23	817.26	718.23
annual cash flow	272.76	359.04	100.20	186.48	531.61	617.89	704.18	617.89
fuel cost	747.09	682.96	861.93	737.45	576.80	553.06	620.76	638.52
insurance ($/yr)	31.91	34.91	31.91	31.91	43.74	48.15	52.56	48.15
shelter ($/yr)	24.71	32.53	9.08	16.90	48.17	55.99	63.80	55.99
labour cost	473.10	405.51	03.13	562.50	313.25	282.88	259.48	285.40
* Tractor ann.cost/drill	314.43	287.82	359.34	307.80	239.30	231.41	259.07	266.96
Drilling cost ($)	1944.31	1892.85	2130.89	1912.33	1863.48	1911.78	2097.08	2038.33
Yield loss cost ($)	62.32	59.63	207.36	81.20	58.73	58.73	58.73	58.73
Total operation cost ($)	7951.39	7629.86	8202.10	7502.86	6626.82	7005.81	6762.75	7203.41

APPENDIX 3 cont'd

Table 15a Feasible 4-WD tractor (unequal)-drill combinations for drilling a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (a soil series Winton).

Single combination no.	25	27	70	71	305	366	421	422
Tractor specification:								
max. power required (kW)	73	78	56	60	84	90	103	115
Drill specification:								
coulter width (m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters	30	35	20	25	45	50	50	55
width (m)	3.000	3.500	2.000	2.500	4.500	5.000	5.000	5.500
actual speed (km/h)	4.40	4.40	4.44	4.44	4.43	4.42	4.38	4.38
actual work rate (ha/h)	1.06	1.23	0.71	0.89	1.60	1.77	1.75	1.93
Operating condition:								
start week no	41	41	40	41	42	42	42	42
start day no	281	281	274	281	288	288	288	288
no. of drilling days	23	20	35	28	15	14	14	12
optimum day no	296	296	296	296	296	296	296	296
expected finish day no	303	300	308	308	302	301	301	299
available work days	28	21	35	28	21	14	14	14
non work days	0	0	0	0	0	0	0	0
actual finish day no	303	300	308	308	302	301	301	299
actual finish week no	44	43	44	44	44	43	43	43
average early loss (%)	0.3330	0.3330	0.7163	0.3330	0.0947	0.0947	0.0947	0.0947
average late loss (%)	0.0711	0.0232	0.2088	0.2088	0.0522	0.0362	0.0362	0.0131
average crop loss (%)	0.4040	0.3562	0.9251	0.5418	0.1469	0.1310	0.1310	0.1078
average crop yield(t/ha)	6.1749	6.1779	6.1426	6.1664	6.1909	6.1919	6.1919	6.1933
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	2471.47	3253.27	907.87	1689.67	4816.87	5598.67	5598.67	6380.47
salvage value	1027.47	1352.49	377.43	702.45	2002.53	2327.55	2327.55	2652.57
repair cost	124.49	163.87	45.73	85.11	242.62	282.00	282.00	321.38
present annual cost	347.31	454.10	138.02	241.83	667.93	774.92	774.92	881.86
annual cash flow	272.76	359.04	100.20	186.48	531.61	617.89	617.89	704.18
fuel cost	1494.18	1365.93	1723.85	1474.91	1153.61	1106.11	1277.04	1241.52
insurance ($/yr)	31.91	34.93	31.91	31.91	43.74	48.15	48.15	52.56
shelter ($/yr)	24.71	32.53	9.08	16.90	48.17	55.99	55.99	63.80
labour cost	946.20	811.02	1406.25	1125.00	626.50	565.75	570.81	518.92
* Tractor ann.cost/drill	625.86	575.63	718.68	615.60	478.60	462.83	533.91	516.14
Drilling cost ($)	3534.74	3330.02	4101.16	3568.25	3064.61	3057.87	3310.97	3325.15
Yield loss cost ($)	501.02	441.68	1147.15	671.83	182.16	162.40	162.40	133.64
Total operation cost ($)	14887.43	14010.28	16407.62	14618.33	11412.65	11839.09	12153.98	12000.71

APPENDIX 3 cont'd

Table 16a Feasible 4-WD tractor (unequal)-drill combinations for drilling a 300 ha at 80% field efficiency a soil workability criterion of 110% and probability level of 90% (soil series Vinton).

Single combination no.		25	27	70	71	305	366	421	422
Tractor specification:									
max. power required	(kW)	73	78	56	60	84	90	103	110
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		30	35	20	25	45	50	50	55
width	(m)	3.000	3.500	2.000	2.500	4.500	5.000	5.000	5.500
actual speed	(km/h)	4.40	4.40	4.44	4.44	4.43	4.42	4.38	4.38
actual work rate	(ha/h)	1.06	1.23	0.71	0.89	1.60	1.77	1.75	1.93
Operating conditions:									
start week no		40	40	39	40	41	41	41	41
start day no		274	274	267	274	281	281	281	281
no. of drilling days		35	30	52	42	23	21	21	19
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		308	303	318	315	303	301	301	299
available work days		35	35	56	42	28	21	21	21
non work days		0	0	0	0	0	0	0	0
actual finish day no		308	303	318	315	303	301	301	299
actual finish week no		44	44	46	45	44	43	43	43
average early loss	(%)	0.7163	0.7163	1.2447	0.7163	0.3330	0.3330	0.3330	0.3330
average late loss	(%)	0.2088	0.0711	0.7018	0.5235	0.0711	0.0362	0.0362	0.0131
average crop loss	(%)	0.9251	0.7874	1.9465	1.2398	0.4040	0.3692	0.3692	0.3460
average crop yield	(t/ha)	6.1426	6.1512	6.0793	6.1231	6.1749	6.1771	6.1771	6.1785
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		2471.47	3253.27	907.87	1689.67	4816.87	5598.67	5598.67	6380.47
salvage value		1027.47	1352.49	377.43	702.45	2002.53	2327.55	2327.55	2652.57
repair cost		361.03	475.23	132.62	246.82	703.64	817.84	817.84	932.04
present annual cost		404.05	528.80	158.87	280.63	778.57	903.46	903.46	1028.35
annual cash flow		272.76	359.04	100.20	186.48	531.61	617.89	617.89	704.18
fuel cost		2241.26	2048.89	2585.78	2212.36	1730.41	1659.17	1915.56	1862.28
insurance	($/yr)	31.91	34.93	31.91	31.91	43.74	48.15	48.15	52.56
shelter	($/yr)	24.71	32.53	9.08	16.90	48.17	55.99	55.99	63.80
labour cost		1419.29	1216.54	2109.38	1687.50	939.75	848.63	856.21	778.38
* Tractor ann.cost/drill		943.30	863.45	1078.03	923.39	717.90	694.24	800.87	777.21
Drilling cost	($)	5156.90	4808.93	6083.08	5245.85	4327.56	4275.82	4655.47	4635.10
Yield loss cost	($)	1720.72	1464.51	3620.45	2305.97	751.53	686.80	686.80	343.66
Total operation cost	($)	22976.23	21099.37	25890.52	22531.60	16737.47	17201.75	17634.34	17325.19

APPENDIX 3 cont'd

Table 17a 4-WD tractor (unequal)-plough combination cost details for used hours in table 8.10.

Single combination no.		26	27	70	71	305	366	421	422
front axle load	(kN)	23.74	23.74	19.75	19.75	25.92	35.09	37.97	37.97
rear axle load	(kN)	33.85	33.85	27.60	27.60	36.64	46.75	47.93	47.93
tractor power reqrd	(kW)	73	78	56	60	84	90	103	110
Plough bodies		5	5	4	4	6	7	7	7
Finance:									
loan interest rate		0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
investment interst rate		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
tax rate		0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
inflation rate		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Tractor:									
purchase price	($)	19306.00	20625.05	14821.23	15876.47	22207.91	23790.77	27220.30	29066.97
purchase age	(yr)	0	0	0	0	0	0	0	0
salvage price	($)	7364.02	7867.16	5653.37	6055.87	8470.92	9074.68	10382.83	11087.22
sale age	(yr)	5	5	5	5	5	5	5	5
road tax	($)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
insurance	($)	117.34	123.14	97.64	102.28	130.09	137.04	152.11	160.22
shelter	($)	193.06	206.25	148.21	158.76	222.08	237.91	272.20	290.67
annual hours	(h)	1000	1000	1000	1000	1000	1000	1000	1000
ploughing hours	(h)	151	141	133	125	117	124	116	108
repair by ploughing	(a%)	1.75	1.64	1.54	1.44	1.36	1.43	1.34	1.25
repair by tillage	(a%)	5.02	4.37	5.15	4.33	2.90	2.77	2.44	2.23
repair(% purchase price)		11.54	11.54	11.54	11.54	11.54	11.54	11.54	11.54
repair by ploughing	($)	430.39	431.05	292.30	292.23	384.14	435.60	466.93	465.37
repair by tillage	($)	1237.36	1149.48	974.32	876.70	823.17	840.08	848.26	827.32
annual repair cost	($)	2842.87	3037.10	2182.47	2337.80	3270.18	3503.26	4008.27	4280.20
ann cost by ploughing	($)	503.09	503.68	342.23	342.00	448.69	502.60	544.81	542.87
ann cost by tillage	($)	1445.39	1343.14	1140.77	1025.99	961.47	980.67	989.73	965.00
annaul cost	($)	3323.12	3548.79	2555.32	2735.98	3819.60	4090.36	4676.80	4992.51
annual cash flow	($)	2255.76	2409.88	1731.75	1855.04	2594.52	2779.77	3180.48	3396.25
Plough:									
purchase price	($)	2308.46	2308.46	1815.49	1815.49	2801.42	3294.38	3294.38	3294.38
purchase age	(yr)	5	5	5	5	5	5	5	5
salvage price	($)	959.70	959.70	754.76	754.76	1164.64	1369.58	1369.58	1369.58
sale age	(yr)	5	5	5	5	5	5	5	5
insurance	($/yr)	31.91	31.91	31.91	31.91	32.38	35.16	35.16	35.16
shelter cost	($/yr)	23.08	23.08	18.15	18.15	28.01	32.94	32.94	32.94
repair(% purchase price)		3.41	3.41	1.64	1.64	3.41	3.41	3.41	3.41
repair cost	($)	100.51	100.51	37.95	37.95	121.97	143.44	143.44	143.44
annual cost	($)	329.81	329.81	249.02	249.02	397.93	466.35	466.35	466.35
annual cash flow	($)	254.77	254.77	200.37	200.37	309.13	363.58	363.58	363.55

? % of purchase price.

APPENDIX 4

Table 1b Predicted performance parameters for optional tyres for 4-WD tractors (equal).

Power		Tyre size	Tyre dimension				Traction parameter					Axle Load	Pres sure	Mobil ity
			b	h	D	δ	CTmax	CT	K	CRR	TE	W	P	
(kW)		(in)	(m)	(m)	(m)	(m)						(kN)	(kPa)	no.
49	F	11.2-28.0	0.28	0.21	1.14	0.04	0.734	0.405	7.82	0.068	74.3	23.4	80.0	14.72
	R	11.2-28.0	0.28	0.21	1.14	0.04	0.735	0.406	7.83	0.068		22.9	80.0	15.00
52	F	11.2-28.0	0.28	0.21	1.14	0.04	0.734	0.405	7.82	0.068	74.3	23.4	80.0	14.72
	R	11.2-28.0	0.28	0.21	1.14	0.04	0.735	0.406	7.83	0.068		22.9	80.0	15.00
55	F	11.2-28.0	0.28	0.21	1.14	0.04	0.734	0.405	7.82	0.068	74.3	23.4	80.0	14.72
	R	11.2-28.0	0.28	0.21	1.14	0.04	0.735	0.406	7.83	0.068		22.9	80.0	15.00
58	F	13.6-36.0	0.34	0.26	1.43	0.05	0.750	0.414	8.07	0.063	75.1	26.5	80.0	19.89
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.747	0.412	8.00	0.064		28.4	80.0	18.60
60	F	11.2-28.0	0.28	0.21	1.14	0.04	0.734	0.405	7.82	0.068	74.3	23.4	80.0	14.72
	R	11.2-28.0	0.28	0.21	1.14	0.04	0.735	0.406	7.83	0.068		22.9	80,0	15.00
63	F	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.04	0.064	75.1	27.4	80.0	19.29
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.03	0.064		27.6	80.0	19.16
67	F	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.04	0.064	75.1	27.4	80.0	19.29
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.03	0.064		27.6	80.0	19.16
70	F	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073	73.3	33.3	170.0	11.79
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073		33.5	170.0	11.75
72	F	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.04	0.064	75.1	27.4	80.0	19.29
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.748	0.413	8.03	0.064		27.6	80.0	19.16
73	F	15.5-38.0	0.39	0.29	1.56	0.06	0.748	0.412	8.02	0.064	75.1	34.3	80.0	18.95
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.747	0.412	8.02	0.064		34.4	80.0	18.91
75	F	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073	73.3	33.3	170.0	11.79
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073		33.5	170.0	11.75
77	F	16.9-34.0	0.43	0.32	1.51	0.06	0.747	0.412	8.02	0.064	75.1	35.8	80.0	18.94
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.746	0.411	7.99	0.065		36.8	80.0	18.39
78	F	15.5-38.0	0.39	0.29	1.56	0.06	0.748	0.412	8.02	0.064	75.1	34.3	80.0	18.95
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.747	0.412	8.02	0.064		34.4	80.0	18.91
81	F	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073	73.3	33.3	170.0	11.79
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073		33.5	170.0	11.75
82	F	13.6-36.0	0.34	0.26	1.43	0.05	0.730	0.404	7.79	0.070	73.9	37.9	160.0	13.91
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.726	0.403	7.77	0.071		40.1	160.0	13.16
83	F	16.9-34.0	0.43	0.32	1.51	0.06	0.747	0.412	8.02	0.064	75.1	35.8	80.0	18.94
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.746	0.411	7.99	0.065		36.8	80.0	18.39
84	F	15.5-38.0	0.39	0.29	1.56	0.06	0.748	0.412	8.02	0.064	75.1	34.3	80.0	18.95
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.747	0.412	8.02	0.064		34.4	80.0	18.91
87	F	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073	73.3	33.3	170.0	11.79
	R	12.4-28.0	0.31	0.24	1.18	0.05	0.718	0.402	7.74	0.073		33.5	170.0	11.75
88	F	13.6-36.0	0.34	0.26	1.43	0.05	0.730	0.404	7.79	0.070	73.9	37.9	160.0	13.91
	R	13.6-36.0	0.34	0.26	1.43	0.05	0.726	0.403	7.77	0.071		40.1	160.0	13.16
89	F	16.9-34.0	0.43	0.32	1.51	0.06	0.746	0.412	8.00	0.064	75.1	36.0	80.0	18.51
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.747	0.412	8.01	0.064		36.0	80.0	18.81
91	F	15.5-38.0	0.39	0.29	1.56	0.06	0.749	0.413	8.04	0.064	75.1	33.5	80.0	19.42
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.746	0.412	7.99	0.064		35.2	80.0	18.47
94	F	15.5-38.0	0.39	0.29	1.56	0.06	0.733	0.405	7.82	0.069	74.2	44.3	130.0	14.67
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.732	0.405	7.81	0.069		45.1	130.0	14.40
95	F	16.9-34.0	0.43	0.32	1.51	0.06	0.746	0.412	8.00	0.064	75.1	36.0	80.0	18.51
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.747	0.412	8.01	0.064		36.0	80.0	18.81
100	F	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069	74.1	47.5	130.0	14.26
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069		47.4	130.0	14.27
101	F	15.5-38.0	0.39	0.29	1.56	0.06	0.733	0.405	7.82	0.069	74.2	44.3	130.0	14.67
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.732	0.405	7.81	0.069		45.1	130.0	14.40
108	F	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069	74.1	47.5	130.0	14.26
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069		47.4	130.0	14.27
109	F	15.5-38.0	0.39	0.29	1.56	0.06	0.733	0.405	7.82	0.069	74.2	44.3	130.0	14.67
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.732	0.405	7.81	0.069		45.1	130.0	14.40
115	F	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069	74.1	47.5	130.0	14.26
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069		47.4	130.0	14.27
116	F	15.5-38.0	0.39	0.29	1.56	0.06	0.733	0.405	7.82	0.069	74.2	44.3	130.0	14.67
	R	15.5-38.0	0.39	0.29	1.56	0.06	0.732	0.405	7.81	0.069		45.1	130.0	14.40
121	F	18.4-30.0	0.47	0.35	1.46	0.07	0.730	0.405	7.80	0.069	74.1	50.2	110.0	14.03
	R	18.4-30.0	0.47	0.35	1.46	0.07	0.732	0.405	7.80	0.069		49.4	110.0	14.26
123	F	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069	74.1	47.5	130.0	14.26
	R	16.9-34.0	0.43	0.32	1.51	0.06	0.732	0.405	7.80	0.069		47.4	130.0	14.27
129	F	18.4-30.0	0.47	0.35	1.46	0.07	0.730	0.405	7.80	0.069	74.1	50.2	110.0	14.03
	R	13.4-30.0	0.47	0.35	1.46	0.07	0.732	0.405	7.80	0.069		49.4	110.0	14.26

Axle load = Dynamic axle laod,
F = Front wheel,
R = Rear wheel.

APPENDIX 4 cont'd

Table 2b Single 4-WD tractor (equal)-plough combinations with implement work rates maximum, actual and theoretical and tractor power (soil series Winton).

Ref	Plough					Dynamic axle load		Slip	Pull		Draw bar	P.T.O	Tract
	Bodies	Width	Depth	Speed	Work rate	Front	Rear		Actual	Theor	power	power	power
no.		(m)	(m)	(km/h)	(ha/h)	(kN)	(kN)	(%)	(kN)	(kN)	(kW)	(kW)	(kW)
15	4	0.25	0.20	5.83	0.47	23.36	22.93	10.28	18.78	21.94	30.42	42.65	49
16	4	0.25	0.20	6.28	0.50	23.36	22.93	10.28	18.78	21.94	32.76	45.93	52
17	4	0.25	0.20	6.73	0.54	23.36	22.93	10.28	18.78	21.94	35.10	49.21	56
18	4	0.25	0.20	7.18	0.57	23.36	22.93	10.28	18.78	21.94	37.44	52.49	60
24	5	0.25	0.20	5.83	0.58	22.53	23.76	10.28	18.78	21.94	30.42	42.65	49
25	5	0.25	0.20	6.28	0.63	22.53	23.76	10.28	18.78	21.94	32.76	45.93	52
87	6	0.25	0.20	5.81	0.70	33.35	33.46	10.61	26.87	31.77	43.36	61.60	70
88	6	0.25	0.20	6.26	0.75	33.35	33.46	10.61	26.87	31.77	46.70	66.33	76
89	6	0.25	0.20	6.70	0.80	33.35	33.46	10.61	26.87	31.77	50.03	71.07	81
90	6	0.25	0.20	7.15	0.86	33.35	33.46	10.61	26.87	31.77	53.37	75.81	87
96	7	0.25	0.20	5.81	0.81	32.53	34.27	10.61	26.87	31.77	43.36	61.60	70
97	7	0.25	0.20	6.26	0.88	32.53	34.27	10.61	26.87	31.77	46.70	66.34	76
98	7	0.25	0.20	6.70	0.94	32.53	34.27	10.61	26.87	31.77	50.03	71.07	81
132	5	0.25	0.20	5.85	0.59	27.36	27.56	9.99	22.67	26.18	36.85	51.08	58
133	5	0.25	0.20	6.30	0.63	27.36	27.56	9.99	22.67	26.18	39.68	55.01	63
134	5	0.25	0.20	6.75	0.68	27.36	27.56	9.99	22.67	26.18	42.51	58.94	67
135	5	0.25	0.20	7.20	0.72	27.36	27.56	9.99	22.67	26.18	45.35	62.87	72
141	6	0.25	0.20	5.85	0.70	26.54	28.38	9.99	22.67	26.18	36.85	51.08	58
142	6	0.25	0.20	6.30	0.76	26.54	28.38	9.99	22.67	26.18	39.68	55.01	63
204	7	0.25	0.20	5.82	0.82	38.75	39.31	10.41	31.53	37.01	51.01	71.87	82
205	7	0.25	0.20	6.27	0.88	38.75	39.31	10.41	31.53	37.01	54.93	77.40	88
206	7	0.25	0.20	6.72	0.94	38.75	39.31	10.41	31.53	37.01	58.86	82.93	95
207	7	0.25	0.20	7.17	1.00	38.75	39.31	10.41	31.53	37.01	62.78	88.46	101
213	8	0.25	0.20	5.82	0.93	37.94	40.12	10.41	31.53	37.02	51.01	71.87	82
214	8	0.25	0.20	6.27	1.00	37.94	40.12	10.41	31.53	37.02	54.94	77.40	88
215	8	0.25	0.20	6.72	1.08	37.94	40.12	10.41	31.53	37.02	58.86	82.93	95
216	8	0.25	0.20	7.17	1.15	37.94	40.12	10.41	31.53	37.02	62.78	88.46	101
249	6	0.25	0.20	5.85	0.70	34.28	34.36	10.00	28.30	32.71	45.99	63.79	73
250	6	0.25	0.20	6.30	0.76	34.28	34.36	10.00	28.30	32.71	49.53	68.70	78
251	6	0.25	0.20	6.75	0.81	34.28	34.36	10.00	28.30	32.71	53.07	73.61	84
252	6	0.25	0.20	7.20	0.86	34.28	34.36	10.00	28.30	32.71	56.60	78.52	90
258	7	0.25	0.20	5.85	0.82	33.47	35.18	10.00	28.30	32.71	45.99	63.80	73
259	7	0.25	0.20	6.30	0.88	33.47	35.18	10.00	28.30	32.71	49.53	68.70	78
260	7	0.25	0.20	6.75	0.94	33.47	35.18	10.00	28.30	32.71	53.07	73.61	84
261	7	0.25	0.20	7.20	1.01	33.47	35.18	10.00	28.30	32.71	56.60	78.52	90
321	8	0.25	0.20	5.83	0.93	44.31	45.13	10.31	36.24	42.39	58.69	82.38	94
322	8	0.25	0.20	6.28	1.00	44.31	45.13	10.31	36.24	42.39	63.21	88.72	101
323	8	0.25	0.20	6.73	1.08	44.31	45.13	10.31	36.24	42.39	67.72	95.05	109
324	8	0.25	0.20	7.18	1.15	44.31	45.13	10.31	36.24	42.39	72.24	101.39	116
359	6	0.25	0.20	6.75	0.81	36.57	36.00	10.02	29.88	34.56	56.02	77.75	89
360	6	0.25	0.20	7.20	0.86	36.57	36.00	10.02	29.88	34.56	59.76	82.94	95
366	7	0.25	0.20	5.85	0.82	35.75	36.82	10.02	29.88	34.56	48.55	67.39	77
367	7	0.25	0.20	6.30	0.88	35.75	36.82	10.02	29.88	34.56	52.29	72.57	83
368	7	0.25	0.20	6.75	0.94	35.75	36.82	10.02	29.88	34.56	56.02	77.75	89
369	7	0.25	0.20	7.20	1.01	35.75	36.82	10.02	29.88	34.56	59.76	82.94	95
375	8	0.25	0.20	5.85	0.94	34.94	37.64	10.02	29.89	34.56	48.55	67.39	77
376	8	0.25	0.20	6.30	1.01	34.94	37.64	10.02	29.89	34.56	52.29	72.57	83
429	8	0.25	0.20	5.83	0.93	47.48	47.45	10.33	38.43	45.00	62.22	87.42	100
430	8	0.25	0.20	6.28	1.00	47.48	47.45	10.33	38.43	45.00	67.01	94.15	108
431	8	0.25	0.20	6.73	1.08	47.48	47.45	10.33	38.43	45.00	71.80	100.87	115
432	8	0.25	0.20	7.17	1.15	47.48	47.45	10.33	38.43	45.00	76.58	107.60	123
485	8	0.25	0.20	6.72	1.08	50.23	49.41	10.34	40.32	47.23	75.32	105.87	121
486	8	0.25	0.20	7.17	1.15	50.23	49.41	10.34	40.32	47.23	80.34	112.92	129

APPENDIX 4 cont'd

Table 3b Summary of costing routine output for 4-WD tractors (equal).

Sale age (Yr)	Power (kW)	Purchase price ($)	Mortgage value ($)	Ratio of (1+g) to (1+i)	Sum repair cost ($)	Sum insurance cost ($)	Salvage value ($)	Net present mortgage value ($)	Sum capital allowance ($)	Sum interest charge ($)	Balancing charge ($)	Present annual cost ($)
5	49	14703.4	3973.3	0.972	4177.6	475.7	5033.4	15494.2	9339.9	4329.6	1442.3	2535.1
5	52	15522.3	4227.1	0.972	4440.9	498.1	5959.1	16377.5	9924.0	4600.4	1532.5	2692.6
5	56	16340.3	4353.8	0.972	4789.4	523.4	5426.8	15401.9	10732.7	4961.4	1652.8	2902.4
5	58	17461.8	4744.6	0.972	4953.7	543.0	6550.5	18564.1	11092.1	5141.9	1712.9	3007.4
5	60	18074.8	4870.5	0.972	5137.9	557.9	6394.4	19526.3	11451.5	5322.4	1773.0	3112.3
5	65	18994.2	5139.5	0.972	5399.3	583.3	7245.1	20519.6	12065.6	5593.1	1863.2	3269.8
5	67	20220.2	5471.6	0.972	5747.8	609.4	7712.7	21344.1	12844.3	5954.1	1983.5	3479.5
5	70	21139.7	5719.8	0.972	6009.1	631.1	8063.4	22637.4	13428.4	6224.9	2073.7	3636.8
5	72	21752.6	5885.6	0.972	6185.4	645.6	8297.3	23499.6	13817.8	6405.4	2133.8	3741.7
5	73	22059.1	5968.5	0.972	6270.5	657.8	8414.2	23830.7	14012.5	6495.7	2163.9	3794.2
5	76	22978.6	6217.3	0.972	6531.9	674.6	8764.9	24824.0	14596.5	6766.4	2254.1	3951.5
5	77	23285.1	6300.3	0.972	6619.0	681.8	8881.8	25155.1	14791.2	6856.7	2284.1	4003.9
5	78	23591.6	6383.2	0.972	6706.1	688.2	8998.7	25486.2	14985.9	6946.9	2314.2	4056.3
5	81	24511.0	6632.0	0.972	6967.5	710.0	9349.4	26479.5	15570.0	7217.7	2404.4	4213.5
5	82	24817.5	6714.9	0.972	7054.6	717.0	9466.3	26810.6	15764.7	7307.9	2434.5	4265.9
5	83	25124.0	6797.8	0.972	7141.7	724.1	9583.2	27141.7	15959.4	7398.2	2464.5	4318.3
5	84	25430.5	6880.7	0.972	7228.9	731.1	9700.1	27472.8	16154.1	7488.4	2494.6	4370.8
5	87	26350.0	7129.5	0.972	7490.2	752.3	10050.9	28466.1	16738.1	7759.2	2584.8	4528.0
5	88	26656.5	7212.5	0.972	7577.3	759.3	10167.8	28797.2	16932.8	7849.4	2614.8	4580.4
5	89	26963.0	7295.4	0.972	7664.5	765.4	10284.7	29128.3	17127.5	7939.7	2644.9	4632.8
5	90	27269.5	7378.3	0.972	7751.6	773.5	10401.6	29459.4	17322.2	8029.9	2675.0	4685.2
5	94	28495.4	7710.0	0.972	8100.1	801.5	10869.2	30783.9	18100.9	8390.9	2795.2	4894.8
5	95	28801.9	7792.9	0.972	8187.2	808.4	10986.1	31115.0	18295.6	8481.2	2825.3	4947.2
5	100	30334.4	8207.6	0.972	8622.8	842.9	11570.6	32770.5	19269.1	8932.4	2975.6	5209.1
5	101	30640.3	8290.5	0.972	8709.9	849.8	11687.6	33101.6	19463.8	9022.7	3005.7	5261.5
5	108	32786.3	8871.0	0.972	9319.8	893.1	12505.9	35419.3	20826.6	9654.4	3216.1	5628.2
5	109	33092.8	8953.9	0.972	9406.9	905.6	12622.8	35750.4	21021.3	9744.7	3240.2	5680.6
5	115	34931.7	9451.5	0.972	9929.7	945.1	13324.2	37737.0	22189.4	10286.2	3426.6	5994.9
5	116	35238.2	9534.4	0.972	10016.8	952.9	13441.2	38068.1	22384.1	10376.4	3456.7	6047.2
5	121	36770.5	9949.0	0.972	10452.4	985.8	14025.7	39723.7	23357.6	10827.7	3607.0	6309.1
5	123	37383.6	10114.9	0.972	10626.6	1005.4	14259.5	40385.9	23746.9	11008.2	3667.1	6413.8
5	129	39222.6	10612.5	0.972	11149.4	1041.1	14959.9	42372.5	24915.1	11549.7	3847.5	6728.0

i = investment interest rate.
g = inflation rate.

APPENDIX 4 Cont'd

Table 4D Performance of 4-WD tractors (equal) and utilisation of multiple combinations selected for a 100 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate + (ha/h)	Performance: Cult. work rate * (ha/h)	Performance: Drill work rate a (ha/h)	Yield loss value ($)
1	2	0.11	0.23	0.34	0.14	107.17	232.20	139.32	0.93	0.43	0.72	207.36
2	2	0.10	0.17	0.27	0.11	99.51	174.15	111.46	1.00	0.57	0.90	73.11
3	2	0.09	0.14	0.23	0.09	92.88	139.32	92.88	1.08	0.72	1.08	62.32
4	2	0.09	0.12	0.20	0.08	87.08	116.10	79.61	1.15	0.86	1.26	58.73
5	2	0.09	0.10	0.19	0.07	85.74	99.51	69.66	1.17	1.00	1.44	58.73
6	2	0.08	0.09	0.17	0.06	79.61	87.07	61.92	1.26	1.15	1.62	58.73
7	2	0.07	0.08	0.15	0.06	71.71	77.69	55.94	1.39	1.29	1.79	58.73
8	2	0.07	0.21	0.27	0.05	66.59	207.17	50.85	1.50	0.48	1.97	58.73
9	2	0.06	0.16	0.22	0.14	62.15	155.38	139.84	1.61	0.64	0.71	207.36
10	2	0.06	0.12	0.18	0.11	58.27	124.31	111.87	1.72	0.80	0.89	73.11
11	2	0.06	0.10	0.17	0.09	61.47	103.59	93.23	1.63	0.96	1.07	62.32
12	2	0.06	0.09	0.15	0.08	57.08	88.79	79.91	1.75	1.13	1.25	58.73
13	1	0.11	0.08	0.18	0.07	106.55	77.69	69.92	0.94	1.29	1.43	58.73
14	2	0.09	0.07	0.15	0.06	85.46	68.58	61.72	1.17	1.46	1.62	58.73
15	2	0.08	0.19	0.26	0.06	79.35	185.16	55.55	1.26	0.54	1.80	58.73
16	2	0.07	0.14	0.21	0.05	74.06	138.87	50.50	1.35	0.72	1.98	58.73
17	2	0.07	0.11	0.18	0.14	69.44	111.10	138.87	1.44	0.90	0.72	207.36
18	2	0.07	0.09	0.16	0.11	71.22	92.58	111.10	1.40	1.08	0.90	73.11
19	2	0.07	0.08	0.15	0.09	66.13	79.36	92.58	1.51	1.26	1.08	62.32
20	2	0.06	0.07	0.13	0.08	61.33	69.76	79.72	1.63	1.43	1.25	58.73
21	2	0.06	0.06	0.12	0.07	56.95	62.01	69.76	1.76	1.61	1.43	58.73
22	1	0.11	0.17	0.28	0.06	106.30	169.11	62.01	0.94	0.59	1.61	58.73
23	1	0.10	0.13	0.23	0.06	99.65	126.83	55.21	1.00	0.79	1.79	58.73
24	1	0.11	0.10	0.21	0.05	107.32	101.47	50.73	0.93	0.99	1.97	58.73
25	1	0.10	0.09	0.18	0.14	99.65	84.56	139.52	1.00	1.18	0.72	207.36
26	1	0.09	0.07	0.17	0.11	93.01	72.48	111.61	1.08	1.38	0.90	73.11
27	1	0.09	0.06	0.15	0.09	87.20	63.42	93.01	1.15	1.58	1.08	62.32
28	2	0.07	0.06	0.13	0.08	71.23	56.12	79.37	1.40	1.78	1.26	58.73
29	2	0.07	0.15	0.22	0.07	66.14	154.33	69.45	1.51	0.65	1.44	58.73
30	2	0.06	0.12	0.18	0.06	61.73	115.75	61.73	1.62	0.86	1.62	58.73
31	2	0.05	0.09	0.15	0.06	57.87	92.60	55.56	1.73	1.08	1.80	58.73
32	2	0.06	0.08	0.14	0.05	61.05	77.16	50.51	1.64	1.30	1.98	58.73
33	2	0.06	0.07	0.12	0.14	56.69	66.14	138.89	1.76	1.51	0.72	207.36
34	1	0.11	0.06	0.16	0.11	105.82	57.87	111.12	0.94	1.73	0.90	73.11
35	1	0.10	0.05	0.15	0.09	99.21	51.44	92.60	1.01	1.94	1.08	62.32
36	1	0.11	0.14	0.25	0.08	107.20	142.94	79.64	0.93	0.70	1.26	58.73
37	1	0.10	0.11	0.21	0.07	99.55	107.20	69.68	1.00	0.93	1.43	58.73
38	1	0.09	0.09	0.18	0.06	92.91	85.76	61.94	1.08	1.17	1.61	58.73
39	1	0.09	0.07	0.16	0.06	87.10	71.47	55.75	1.15	1.40	1.79	58.73
40	2	0.06	0.06	0.12	0.05	61.74	61.06	50.52	1.62	1.64	1.98	58.73
41	2	0.06	0.05	0.11	0.14	57.88	53.43	138.92	1.73	1.87	0.72	207.36
42	2	0.06	0.05	0.11	0.11	61.06	47.49	111.13	1.64	2.11	0.90	73.11
43	2	0.06	0.13	0.19	0.09	56.70	132.30	92.61	1.76	0.76	1.08	62.32
44	1	0.11	0.10	0.21	0.08	105.64	99.23	79.38	0.94	1.01	1.26	58.73
45	1	0.10	0.08	0.18	0.07	99.23	79.38	69.46	1.01	1.26	1.44	58.73
46	1	0.11	0.07	0.17	0.06	106.86	66.15	61.74	0.94	1.51	1.62	58.73
47	1	0.10	0.06	0.16	0.06	99.23	56.70	55.57	1.01	1.76	1.80	58.73
48	1	0.11	0.05	0.16	0.05	107.23	49.79	50.69	0.93	2.01	1.97	58.73
49	1	0.10	0.04	0.14	0.14	99.57	44.26	139.40	1.00	2.26	0.72	207.36
50	1	0.09	0.12	0.22	0.11	92.94	123.91	111.52	1.08	0.81	0.90	73.11
51	1	0.09	0.09	0.18	0.09	87.13	92.94	92.94	1.15	1.08	1.08	62.32
52	1	0.09	0.07	0.17	0.08	92.95	74.36	79.67	1.08	1.35	1.25	58.73
53	1	0.09	0.06	0.15	0.07	87.14	61.97	69.71	1.15	1.61	1.43	58.73

Tr = Tractors
\+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
a Drill work rate only using one tractor.

APPENDIX 4 cont'd

Table 5b Performance of 4-WD tractors (equal) and utilisation of multiple combinations selected for a 200 ha, operation starting at day no. 267 (week 39) and optimum day no. 296 for winter wheat, at 80% field efficieny together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate (ha/h) +	Performance: Cult. work rate (ha/h) *	Performance: Drill work rate (ha/h) @	Yield loss value ($)
1	4	0.11	0.46	0.57	0.28	107.17	464.40	278.64	1.87	0.43	0.72	1105.79
2	4	0.10	0.35	0.45	0.22	99.51	348.30	222.91	2.01	0.57	0.90	630.48
3	3	0.12	0.28	0.40	0.19	123.84	278.64	185.76	1.61	0.72	1.08	501.02
4	3	0.12	0.23	0.35	0.16	116.10	232.20	159.22	1.72	0.86	1.26	429.11
5	3	0.11	0.20	0.31	0.14	114.31	199.03	139.32	1.75	1.00	1.44	414.71
6	3	0.11	0.17	0.28	0.12	106.15	174.15	123.84	1.88	1.15	1.62	182.18
7	3	0.10	0.16	0.25	0.11	95.62	155.38	111.87	2.09	1.29	1.79	146.23
8	3	0.09	0.41	0.50	0.10	88.79	414.35	101.70	2.25	0.48	1.97	133.64
9	2	0.12	0.31	0.44	0.28	124.30	310.76	279.69	1.61	0.64	0.71	1105.79
10	2	0.12	0.25	0.37	0.22	116.54	248.61	223.75	1.72	0.80	0.89	630.48
11	2	0.12	0.21	0.33	0.19	122.94	207.17	186.46	1.63	0.96	1.07	501.02
12	2	0.11	0.18	0.29	0.16	114.16	177.58	159.82	1.75	1.13	1.25	429.11
13	2	0.11	0.16	0.26	0.14	106.55	155.38	139.84	1.88	1.29	1.43	414.71
14	3	0.11	0.14	0.25	0.12	113.95	137.16	123.44	1.76	1.46	1.62	182.18
15	3	0.11	0.37	0.48	0.11	105.81	370.32	111.10	1.89	0.54	1.80	146.23
16	3	0.10	0.28	0.38	0.10	98.75	277.74	101.00	2.03	0.72	1.98	133.64
17	3	0.09	0.22	0.31	0.28	92.58	222.19	277.74	2.16	0.90	0.72	1105.79
18	3	0.09	0.19	0.28	0.22	94.95	185.16	222.19	2.11	1.08	0.90	630.48
19	3	0.09	0.16	0.25	0.19	88.17	158.71	185.16	2.27	1.26	1.08	501.02
20	2	0.12	0.14	0.26	0.16	122.65	139.52	159.45	1.63	1.43	1.25	429.11
21	2	0.11	0.12	0.24	0.14	113.89	124.01	139.52	1.76	1.61	1.43	414.71
22	2	0.11	0.34	0.44	0.12	106.30	338.22	124.01	1.88	0.59	1.61	182.18
23	2	0.10	0.25	0.35	0.11	99.65	253.67	111.61	2.01	0.79	1.79	146.23
24	2	0.11	0.20	0.31	0.10	107.32	202.93	101.47	1.86	0.99	1.97	133.64
25	2	0.10	0.17	0.27	0.28	99.65	169.11	279.03	2.01	1.18	0.72	1105.79
26	2	0.09	0.14	0.24	0.22	93.01	144.95	223.23	2.15	1.38	0.90	630.48
27	2	0.09	0.13	0.21	0.19	87.20	126.83	186.02	2.29	1.58	1.08	501.02
28	3	0.09	0.11	0.21	0.16	94.97	112.24	158.74	2.11	1.78	1.26	429.11
29	3	0.09	0.31	0.40	0.14	88.19	308.65	138.89	2.27	0.65	1.44	414.71
30	2	0.12	0.23	0.35	0.12	123.46	231.49	123.46	1.62	0.86	1.62	182.18
31	2	0.12	0.19	0.30	0.11	115.75	185.19	111.12	1.73	1.08	1.80	146.23
32	2	0.12	0.15	0.28	0.10	122.11	154.33	101.01	1.64	1.30	1.98	133.64
33	2	0.11	0.13	0.25	0.28	113.38	132.28	277.79	1.76	1.51	0.72	1105.79
34	2	0.11	0.12	0.22	0.22	105.82	115.75	222.23	1.89	1.73	0.90	630.48
35	2	0.10	0.10	0.20	0.19	99.21	102.89	185.19	2.02	1.94	1.08	501.02
36	2	0.11	0.29	0.39	0.16	107.20	285.88	159.27	1.87	0.70	1.26	429.11
37	2	0.10	0.21	0.31	0.14	99.55	214.41	139.37	2.01	0.93	1.43	414.71
38	2	0.09	0.17	0.26	0.12	92.91	171.53	123.88	2.15	1.17	1.61	182.18
39	2	0.09	0.14	0.23	0.11	87.10	142.94	111.49	2.30	1.40	1.79	146.23
40	2	0.12	0.12	0.25	0.10	123.48	122.13	101.03	1.62	1.64	1.98	133.64
41	2	0.12	0.11	0.22	0.28	115.76	106.86	277.83	1.73	1.87	0.72	1105.79
42	2	0.12	0.09	0.22	0.22	122.13	94.99	222.27	1.64	2.11	0.90	630.48
43	2	0.11	0.26	0.38	0.19	113.40	264.60	185.22	1.76	0.76	1.08	501.02
44	2	0.11	0.20	0.30	0.16	105.84	198.45	158.76	1.89	1.01	1.26	429.11
45	2	0.10	0.16	0.26	0.14	99.23	158.76	138.92	2.02	1.26	1.44	414.71
46	2	0.11	0.13	0.24	0.12	106.86	132.30	123.48	1.87	1.51	1.62	182.18
47	2	0.10	0.11	0.21	0.11	99.23	113.40	111.13	2.02	1.76	1.80	146.23
48	2	0.11	0.10	0.21	0.10	107.23	99.57	101.38	1.87	2.01	1.97	133.64
49	2	0.10	0.09	0.19	0.28	99.57	88.51	278.81	2.01	2.26	0.72	1105.79
50	2	0.09	0.25	0.34	0.22	92.94	247.83	223.05	2.15	0.81	0.90	630.48
51	2	0.09	0.19	0.27	0.19	87.13	185.87	185.87	2.30	1.08	1.08	501.02
52	2	0.09	0.15	0.24	0.16	92.95	148.71	159.34	2.15	1.35	1.25	429.11
53	2	0.09	0.12	0.21	0.14	87.14	123.93	139.42	2.30	1.61	1.43	414.71

Tr = Tractors
+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
@ Drill work rate only using one tractor.

APPENDIX 4 cont'd

Table 6b Performance of 4-WD tractors (equal) and utilisation of multiple combinations selected for a 300 ha, operation starting at day no. 260 (week 38) and optimum day no. 296 for winter wheat, at 80% field efficiency together with crop yield losses (soil series Winton).

Ref no.	No. of tr	Proportional use: Ploughing	Proportional use: Cultivation	Proportional use: Tillage	Proportional use: Drilling	Operation use: Ploughing (h)	Operation use: Cultivation (h)	Operation use: Drilling (h)	Performance: Plough work rate + (ha/h)	Performance: Cult. work rate * (ha/h)	Performance: Drill work rate @ (ha/h)	Yield Loss value (s)
1	3	0.21	0.70	0.91	0.42	214.34	696.60	417.96	1.40	0.43	0.72	3620.45
2	3	0.20	0.52	0.72	0.33	199.03	522.45	334.37	1.51	0.57	0.90	2206.18
3	3	0.19	0.42	0.60	0.28	185.76	417.96	278.64	1.61	0.72	1.08	1658.69
4	3	0.17	0.35	0.52	0.24	174.15	348.30	238.83	1.72	0.86	1.26	1075.17
5	3	0.17	0.30	0.47	0.21	171.47	298.54	208.98	1.75	1.00	1.44	889.08
6	3	0.16	0.26	0.42	0.19	159.22	261.23	185.76	1.88	1.15	1.62	751.53
7	2	0.22	0.23	0.45	0.17	215.14	233.07	167.81	1.39	1.29	1.79	662.53
8	2	0.20	0.62	0.82	0.15	199.78	621.52	152.56	1.50	0.48	1.97	643.66
9	2	0.19	0.47	0.65	0.42	186.46	466.14	419.53	1.61	0.64	0.71	3620.45
10	2	0.17	0.37	0.55	0.34	174.80	372.91	335.62	1.72	0.80	0.89	2206.18
11	2	0.18	0.31	0.50	0.28	184.41	310.76	279.69	1.63	0.96	1.07	1658.69
12	2	0.17	0.27	0.44	0.24	171.24	266.37	239.73	1.75	1.13	1.25	1075.17
13	2	0.16	0.23	0.39	0.21	159.82	233.07	209.76	1.88	1.29	1.43	889.08
14	3	0.17	0.21	0.38	0.19	170.92	205.74	185.16	1.76	1.46	1.62	751.53
15	3	0.16	0.56	0.71	0.17	158.71	555.48	166.65	1.89	0.54	1.80	662.53
16	2	0.22	0.42	0.64	0.15	222.19	416.61	151.50	1.35	0.72	1.98	630.17
17	2	0.21	0.33	0.54	0.42	208.31	333.29	416.61	1.44	0.90	0.72	3620.45
18	2	0.21	0.28	0.49	0.33	213.65	277.74	333.29	1.40	1.08	0.90	2206.18
19	2	0.20	0.24	0.44	0.28	198.39	238.07	277.74	1.51	1.26	1.08	1658.69
20	2	0.18	0.21	0.39	0.24	183.98	209.27	239.17	1.63	1.43	1.25	1075.17
21	2	0.17	0.19	0.36	0.21	170.84	186.02	209.28	1.76	1.61	1.43	889.08
22	2	0.16	0.51	0.67	0.19	159.45	507.33	186.02	1.88	0.59	1.61	751.53
23	2	0.15	0.38	0.53	0.17	149.48	380.50	167.42	2.01	0.79	1.79	662.53
24	2	0.16	0.30	0.47	0.15	160.98	304.40	152.20	1.86	0.99	1.97	643.66
25	2	0.15	0.25	0.40	0.42	149.48	253.67	418.55	2.01	1.18	0.72	3620.45
26	2	0.14	0.22	0.36	0.34	139.52	217.43	334.84	2.15	1.38	0.90	2206.18
27	2	0.13	0.19	0.32	0.28	130.80	190.25	279.03	2.29	1.58	1.08	1658.69
28	2	0.21	0.17	0.38	0.24	213.68	168.36	238.10	1.40	1.78	1.26	1075.17
29	2	0.20	0.46	0.66	0.21	198.42	462.98	208.34	1.51	0.65	1.44	889.08
30	2	0.19	0.35	0.53	0.19	185.19	347.24	185.19	1.62	0.86	1.62	751.53
31	2	0.17	0.28	0.45	0.17	173.62	277.79	166.67	1.73	1.08	1.80	662.53
32	2	0.18	0.23	0.41	0.15	183.16	231.49	151.52	1.64	1.30	1.98	630.17
33	2	0.17	0.20	0.37	0.42	170.07	198.42	416.68	1.76	1.51	0.72	3620.45
34	2	0.16	0.17	0.33	0.33	158.74	173.62	333.35	1.89	1.73	0.90	2206.18
35	2	0.15	0.15	0.30	0.28	148.82	154.33	277.79	2.02	1.94	1.08	1658.69
36	2	0.16	0.43	0.59	0.24	160.81	428.82	238.91	1.87	0.70	1.26	1075.17
37	2	0.15	0.32	0.47	0.21	149.32	321.61	209.05	2.01	0.93	1.43	889.08
38	2	0.14	0.26	0.40	0.19	139.37	257.29	185.82	2.15	1.17	1.61	751.53
39	2	0.13	0.21	0.35	0.17	130.65	214.41	167.24	2.30	1.40	1.79	662.53
40	2	0.19	0.18	0.37	0.15	185.22	183.19	151.55	1.62	1.64	1.98	630.17
41	2	0.17	0.16	0.33	0.42	173.65	160.29	416.75	1.73	1.87	0.72	3620.45
42	2	0.18	0.14	0.33	0.33	183.19	142.48	333.40	1.64	2.11	0.90	2206.18
43	2	0.17	0.40	0.57	0.28	170.10	396.91	277.83	1.76	0.76	1.08	1658.69
44	2	0.16	0.30	0.46	0.24	158.76	297.68	238.14	1.89	1.01	1.26	1075.17
45	2	0.15	0.24	0.39	0.21	148.84	238.14	208.38	2.02	1.26	1.44	889.08
46	2	0.16	0.20	0.36	0.19	160.29	198.45	185.22	1.87	1.51	1.62	751.53
47	2	0.15	0.17	0.32	0.17	148.84	170.10	166.70	2.02	1.76	1.80	662.53
48	2	0.16	0.15	0.31	0.15	160.65	149.36	152.08	1.87	2.01	1.97	643.66
49	2	0.15	0.13	0.28	0.42	149.36	132.76	418.21	2.01	2.26	0.72	3620.45
50	2	0.14	0.37	0.51	0.34	139.40	371.74	334.57	2.15	0.81	0.90	2206.18
51	2	0.13	0.28	0.41	0.28	130.69	278.81	278.81	2.30	1.08	1.08	1658.69
52	2	0.14	0.22	0.36	0.24	139.42	223.07	239.01	2.15	1.35	1.25	1075.17
53	2	0.13	0.19	0.32	0.21	130.71	185.89	209.13	2.30	1.61	1.43	889.08

Tr = Tractors
\+ Plough work rate for tractor fleet
* Cult.=cultivator; work rate only using one tractor
@ Drill work rate only using one tractor.

APPENDIX 4 cont'd

Table 7b 4-WD (equal) tractor costs in different operations for a period of ownership of 5 year(s)

Ref			Tractor present cost			Tractor repair cost			Insurance	Tax	Shelte
no.	Power (kW)	Purchase price ($)	Ploughing ($)	Cultivation ($)	Drilling ($)	Ploughing ($)	Cultivation ($)	Drilling ($)	cost ($)	cost ($)	cost ($)
1	49	14703.37	271.7	1177.3	706.4	232.0	1005.5	603.3	97.1	15.0	147.0
2	52	15622.84	268.0	937.8	600.2	228.9	801.3	512.8	101.2	15.0	156.2
3	56	16848.80	359.4	808.7	539.2	307.3	691.3	460.9	106.6	15.0	168.5
4	60	18074.76	361.3	722.7	495.6	309.0	618.0	423.8	111.9	15.0	180.8
5	49	14703.37	289.8	504.6	353.2	247.5	430.9	301.6	97.1	15.0	147.0
6	52	15622.84	285.8	468.9	333.5	244.2	400.6	284.9	101.2	15.0	156.2
7	70	21139.66	347.8	565.1	406.9	297.6	483.7	348.3	125.4	15.0	211.4
8	76	22978.60	350.9	1637.3	401.9	300.4	1402.0	344.1	133.5	15.0	229.8
9	81	24511.05	523.8	1309.4	1178.5	448.7	1121.6	1009.5	140.2	15.0	245.1
10	87	26349.99	527.7	1125.7	1013.1	452.2	964.6	868.2	148.3	15.0	263.5
11	70	21139.66	447.1	753.5	678.1	382.7	644.9	580.4	125.4	15.0	211.4
12	76	22978.60	451.1	701.7	631.5	386.3	600.9	540.8	133.5	15.0	229.8
13	81	24511.05	448.9	654.7	589.2	384.6	560.8	504.7	140.2	15.0	245.1
14	58	17461.78	342.7	412.5	371.2	293.0	352.7	317.4	109.2	15.0	174.6
15	63	18994.23	346.0	1210.9	363.3	295.9	1035.8	310.7	116.0	15.0	189.9
16	67	20220.19	343.6	966.4	351.4	294.0	827.0	300.7	121.4	15.0	202.2
17	72	21752.64	346.4	831.4	1039.2	296.5	711.7	889.6	128.1	15.0	217.5
18	58	17461.78	285.6	556.8	668.2	244.2	476.1	571.3	109.2	15.0	174.6
19	63	18994.23	288.3	518.9	605.4	246.6	443.9	517.9	116.0	15.0	189.9
20	82	24817.54	523.2	595.2	680.2	448.2	509.9	582.7	141.6	15.0	248.2
21	88	26656.48	521.7	568.0	639.0	447.0	486.8	547.6	149.6	15.0	266.6
22	95	28801.91	525.9	1673.3	613.5	450.8	1434.5	526.0	159.1	15.0	288.0
23	101	30640.85	524.3	1334.7	587.3	449.6	1144.5	503.6	167.1	15.0	306.4
24	82	24817.54	457.8	865.7	432.9	392.2	741.6	370.8	141.6	15.0	248.2
25	88	26656.48	456.5	774.6	1278.1	391.2	663.8	1095.3	149.6	15.0	266.6
26	95	28801.91	460.1	717.1	1104.3	394.5	614.8	946.7	159.1	15.0	288.0
27	101	30640.85	458.8	667.3	978.8	393.4	572.3	839.3	167.1	15.0	306.4
28	73	22059.13	360.3	425.9	602.3	308.5	364.6	515.6	129.4	15.0	220.6
29	78	23591.58	357.7	1252.0	563.4	306.4	1072.2	482.5	136.2	15.0	235.9
30	84	25430.52	539.6	1011.8	539.6	462.3	866.9	462.3	144.2	15.0	254.3
31	90	27269.46	542.3	867.7	520.6	464.8	743.6	446.2	152.3	15.0	272.7
32	73	22059.13	463.3	585.5	383.3	396.6	501.3	328.1	129.4	15.0	220.6
33	78	23591.58	459.9	536.6	1126.8	393.9	459.5	965.0	136.2	15.0	235.9
34	84	25430.52	462.5	505.9	971.3	396.3	433.4	832.2	144.2	15.0	254.3
35	90	27269.46	464.8	482.0	867.7	398.4	413.1	743.6	152.3	15.0	272.7
36	94	28495.42	524.7	1399.3	779.6	449.8	1199.6	668.3	157.7	15.0	285.0
37	101	30640.85	523.8	1128.1	733.3	449.1	967.4	628.8	167.1	15.0	306.4
38	109	33092.77	527.8	974.4	703.7	452.8	835.8	603.7	177.9	15.0	330.9
39	116	35238.20	526.7	864.4	674.2	452.0	741.7	578.5	187.3	15.0	352.4
40	89	26962.97	572.1	565.8	468.0	490.3	484.9	401.1	151.0	15.0	269.6
41	95	28801.91	572.7	528.7	1374.5	491.0	453.2	1178.3	159.1	15.0	288.0
42	77	23285.09	489.0	380.3	889.9	418.7	325.7	762.1	134.8	15.0	232.9
43	83	25124.03	489.7	1142.7	799.9	419.5	978.9	685.2	142.9	15.0	251.2
44	89	26962.97	490.3	919.4	735.5	420.2	787.9	630.3	151.0	15.0	269.6
45	95	28801.91	490.9	785.4	687.3	420.8	673.3	589.2	159.1	15.0	288.0
46	77	23285.09	427.9	529.7	494.4	366.4	453.6	423.4	134.8	15.0	232.9
47	83	25124.03	428.5	489.7	479.9	367.1	419.5	411.1	142.9	15.0	251.2
48	100	30334.36	558.6	518.7	528.1	479.0	444.8	452.9	165.8	15.0	303.3
49	108	32786.28	560.4	498.1	1569.2	480.7	427.3	1346.0	176.6	15.0	327.9
50	115	34931.71	557.1	1485.7	1337.1	478.0	1274.8	1147.3	186.0	15.0	349.3
51	123	37383.63	558.8	1192.1	1192.1	479.6	1023.2	1023.2	196.8	15.0	373.8
52	121	36770.65	586.4	938.3	1005.3	503.3	805.2	862.7	194.1	15.0	367.7
53	129	39222.57	586.3	833.8	938.0	503.3	715.8	805.2	204.8	15.0	392.2

* Repair cost only for ploughing operation based on ploughing hours divided by 1000.

APPENDIX 4 cont'd

Table 30 Feasible 4-WD tractor (equal)-plough combinations for ploughing a 100 ha operation starting at week 39 and expected to finish at week 40, at 80% field efficiency (soil series Vinton).

Single combination no.	16	18	96	97	98	205	429	460
Number tractors	2	2	2	2	1	2	1	1
Tractor specification:								
max. power required (kW)	52	60	70	76	81	88	100	129
P.T.O. power (kW)	45.93	52.49	61.60	66.34	71.07	77.40	87.42	112.92
drawbar power (kW)	32.76	37.44	43.36	46.70	50.03	54.93	62.22	80.34
static weight (kN)	40.41	40.41	56.58	56.58	56.58	67.39	83.25	87.96
dynamic weight (kN)	46.29	46.29	60.81	66.81	60.81	78.01	94.93	99.64
weight/power (kg/kW)	89.41	78.23	90.21	89.34	83.38	89.43	90.33	78.23
dynamic axle load								
front (kN)	23.36	23.36	32.53	32.53	32.53	38.75	47.48	50.23
rear (kN)	22.93	22.93	34.27	34.27	34.27	39.31	47.45	49.41
front tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
rear tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
wheel slip (%)	10.28	10.28	10.61	10.61	10.61	10.41	10.33	10.34
actual thrust (kN)	18.78	18.78	26.87	26.87	26.67	31.53	33.43	40.32
front rolling res. (kN)	0.80	0.80	1.18	1.18	1.18	1.36	1.64	1.74
rear rolling res. (kN)	0.78	0.78	1.27	1.27	1.27	1.38	1.64	1.71
maximum thrust (kN)	33.98	33.98	47.95	47.95	47.95	56.83	69.44	72.83
Plough specification:								
bodies	4	4	7	7	7	7	3	3
weight (kN)	5.88	5.88	10.23	10.23	10.23	10.23	11.68	11.68
forward speed (km/h)	6.28	7.18	5.81	6.26	6.76	6.27	5.33	7.17
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.50	0.57	0.81	0.88	0.94	0.88	0.93	1.15
draught (kN)	14.93	15.41	25.73	26.10	26.50	26.12	29.42	30.81
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	267	267	267	267	267	267	267	267
no. of ploughing days	12	10	7	7	13	7	13	10
expected finish day no	280	280	280	280	280	280	280	280
plough finish day no	280	280	280	280	280	280	280	280
plough penalty days	0	0	0	0	0	0	0	0
plough finish week no	40	40	39	39	40	39	40	40
Operational costs ($)								
tractor purchase price	15622.84	18074.76	21139.65	22978.60	24511.05	26656.48	30334.30	39222.57
plough purchase price	1815.49	1815.49	3294.38	3294.38	3294.38	3294.38	3737.33	3737.33
tractor annual cost	2692.56	3112.34	3636.84	3951.46	4213.53	4580.39	5209.14	6725.22
plough annual cost	244.03	244.03	433.16	433.16	466.35	433.16	534.77	534.77
tractor ann. cost/plough	267.95	271.01	223.55	225.54	448.94	203.83	558.59	586.27
fuel cost	567.02	566.40	479.06	481.16	967.24	540.19	1160.92	1225.14
labour cost	497.57	435.38	307.35	285.39	532.73	284.73	536.17	435.69
other operating cost	77.17	76.85	89.73	89.70	110.76	92.66	127.73	129.15
Single combination cost($)	1653.74	1593.67	1532.85	1514.95	2526.03	1617.57	2924.12	2911.02
Total ploughing cost ($)	3307.5	3187.3	3065.7	3029.9	2526.0	3235.1	2924.2	2911.0

APPENDIX 4 cont'd

Table 9b Feasible 4-WD tractor (equal)-plough combinations for ploughing a 200 ha operation starting at week 39 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	16	18	96	97	98	205	429	[illegible]
Number tractors	3	3	2	2	2	2	2	[illegible]
Tractor specification:								
max. power required (kW)	52	60	70	76	81	56	100	[illegible]
P.T.O. power (kW)	45.93	52.49	61.60	66.34	71.07	77.40	87.42	[illegible]
drawbar power (kW)	32.76	37.44	43.36	46.70	50.03	54.93	62.22	80.34
static weight (kN)	40.41	40.41	56.58	56.58	56.58	67.64	83.25	87.96
dynamic weight (kN)	46.29	46.29	66.81	66.81	66.81	78.06	94.73	99.76
weight/power (kg/kW)	89.41	78.23	96.21	89.34	83.38	89.47	96.33	[illegible]
dynamic axle load								
front (kN)	23.36	23.36	32.53	32.53	32.53	38.75	47.48	50.23
rear (kN)	22.93	22.93	34.27	34.27	34.27	39.31	47.45	49.41
front tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
rear tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
wheel slip (%)	10.28	10.28	10.61	10.61	10.61	10.41	10.33	10.34
actual thrust (kN)	18.78	18.78	26.87	26.87	26.87	31.53	38.43	40.32
front rolling res. (kN)	0.80	0.80	1.18	1.18	1.18	1.36	1.64	1.74
rear rolling res. (kN)	0.78	0.78	1.27	1.27	1.27	1.38	1.64	1.71
maximum thrust (kN)	33.98	33.98	47.95	47.95	47.95	56.83	69.44	72.83
Plough specification:								
bodies	4	4	7	7	7	7	8	[illegible]
weight (kN)	5.88	5.88	10.23	0.23	10.23	10.23	11.56	[illegible]
forward speed (km/h)	6.28	7.18	5.81	6.26	6.70	6.27	5.33	7.17
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	[illegible]
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
actual work rate (ha/h)	0.50	0.57	0.81	0.88	0.94	0.86	0.93	1.15
draught (kN)	14.93	15.41	25.73	26.10	26.50	26.12	29.42	[illegible]
Soil specification:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	14.02
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	[illegible]
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	[illegible]
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.15
workability (% of FC)	110	110	110	110	110	110	110	110
probability level (%)	90	90	90	90	90	90	90	90
Operating condition								
plough start day no	267	267	267	267	267	267	267	267
no. of ploughing days	16	14	15	14	13	14	13	13
expected finish day no	287	287	287	287	287	287	287	287
plough finish day no	287	287	287	287	287	287	287	287
plough penalty days	0	0	0	0	0	0	0	0
plough finish week no	41	40	41	40	40	40	40	40
Operational cost: ($)								
tractor purchase price	15022.84	18074.76	21139.66	22578.60	24511.05	26650.48	30334.30	[illegible]
plough purchase price	1815.49	1815.49	3294.38	3294.38	3294.38	3294.38	3757.33	3757.33
tractor annual cost	2692.56	3112.34	3636.84	3951.46	4213.53	4580.39	5207.14	[illegible]
plough annual cost	249.02	249.02	466.35	466.35	466.35	466.35	534.77	534.77
tractor ann. cost/plough	357.26	361.34	447.11	451.09	443.94	521.07	[illegible]	[illegible]
fuel cost	756.03	755.21	958.12	962.31	967.24	1092.36	[illegible]	[illegible]
labour cost	663.43	580.50	614.69	570.79	532.73	569.46	535.17	[illegible]
other operating cost	86.20	85.78	111.36	111.29	110.75	117.22	127.73	[illegible]
Single combination cost($)	2111.95	2031.85	2597.63	2561.83	2526.02	2767.07	[illegible]	[illegible]
Total ploughing cost ($)	6335.3	6095.6	5195.3	5123.7	5052.0	5534.1	[illegible]	[illegible]

APPENDIX 4 cont'd

Table 10b Feasible 4-WD tractor (equal)-plough combinations for ploughing a 300 ha operations starting at week 38 and expected to finish at week 41, at 80% field efficiency (soil series Winton).

Single combination no.	16	18	96	97	98	205	427	[illegible]
Number tractors	3	3	2	2	2	2	2	[illegible]
Tractor specifications:								
max. power required (kW)	53	60	70	76	81	85	10[illegible]	12[illegible]
P.T.O. power (kW)	45.93	52.49	61.60	66.34	71.07	77.40	87.4[illegible]	11[illegible]
drawbar power (kW)	32.76	37.44	43.36	46.70	50.03	54.93	62.22	[illegible]
static weight (kN)	40.41	40.41	56.58	56.58	56.56	67.84	83.25	87.[illegible]
dynamic weight (kN)	46.29	46.29	66.81	66.81	66.81	76.05	94.93	[illegible]
weight/power (kg/kW)	89.41	78.23	96.21	89.34	83.38	89.47	96.33	75.2[illegible]
dynamic axle load								
front (kN)	23.36	23.36	32.53	32.53	32.53	38.75	47.48	50.23
rear (kN)	22.93	22.93	34.27	34.27	34.27	39.31	47.45	49.41
front tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
rear tyre dimension (in)	11.2-28.0	11.2-28.0	12.4-28.0	12.4-28.0	12.4-28.0	13.6-36.0	16.9-34.0	18.4-38.0
front tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
rear tyre pressure (kPa)	80.00	80.00	170.00	170.00	170.00	160.00	130.00	110.00
wheel slip (%)	10.28	10.28	10.61	10.61	10.61	10.41	10.33	10.34
actual thrust (kN)	18.78	18.78	26.87	26.87	26.87	31.53	38.43	40.32
front rolling res. (kN)	0.80	0.80	1.18	1.18	1.18	1.36	1.64	1.74
rear rolling res. (kN)	0.78	0.78	1.27	1.27	1.27	1.38	1.64	1.71
maximum thrust (kN)	33.98	33.98	47.95	47.95	47.95	56.83	69.44	72.83
Plough specifications:								
bodies	4	4	7	7	7	7	8	[illegible]
weight (kN)	5.88	5.88	10.23	10.23	10.23	10.23	11.6[illegible]	11.[illegible]
forward speed (km/h)	6.28	7.18	5.81	6.26	6.70	6.27	5.[illegible]	7.17
cut depth (m)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	[illegible]
cut width (m)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	[illegible]
actual work rate (ha/h)	0.58	0.57	0.81	0.88	0.94	0.85	0.9[illegible]	1.15
draught (kN)	14.93	15.41	25.73	26.10	26.50	[illegible].12	29.42	3[illegible]
Soil specifications:								
specific weight (kN/m3)	14.02	14.02	14.02	14.02	14.02	14.02	14.02	[illegible]
cone index (kN/m2)	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	1.3360	[illegible]
field capacity (mm)	130.00	130.00	130.00	130.00	130.00	130.00	130.00	[illegible]
moisture content (%w/w)	27.15	27.15	27.15	27.15	27.15	27.15	27.15	27.1[illegible]
workability (% of FC)	110	110	110	110	110	110	110	11[illegible]
probability level (%)	90	90	90	90	90.	90	90	9[illegible]
Operating condition								
plough start day no	260	260	260	260	260	260	260	260
no. of ploughing days	24	21	23	21	19	21	2[illegible]	16
expected finish day no	287	287	287	287	287	287	287	[illegible]
plough finish day no	287	287	287	287	287	287	287	[illegible]
plough penalty days	0	0	0	0	0	0	0	[illegible]
plough finish week no	41	40	41	40	40	40	40	[illegible]
Operational costs: ($)								
tractor purchase price	15622.84	18074.76	21139.66	22978.60	24511.05	26050.48	30334.30	[illegible]
plough purchase price	1615.49	1815.49	3294.38	3294.38	3294.38	3294.38	3757.3[illegible]	3777.3[illegible]
tractor annual cost	2692.56	3112.34	3636.84	3951.46	4213.53	4580.39	5209.14	[illegible]
plough annual cost	262.32	262.32	516.64	516.64	516.64	516.64	592.59	592.5[illegible]
tractor ann. cost/plough	535.90	542.01	676.66	676.63	673.41	782.50	[illegible]	[illegible]
fuel cost	1134.05	1132.81	1437.18	1443.47	1450.86	1036.57	1750.3[illegible]	1737.71
labour cost	995.14	870.75	922.04	856.18	799.10	854.1[illegible]	804.25	[illegible]
other operating cost	104.28	103.65	132.96	132.83	132.08	141.77	153.69	155.61
Single combination cost ($)	3031.08	2911.54	3579.59	3625.80	3572.10	3733.67	4135.70	4119.[illegible]
Total ploughing cost ($)	9095.1	8734.6	7359.0	7251.6	7144.2	7257.3	8277.6	[illegible]

Table 11b Feasible 4-WD tractor (equal)-cultivator combinations for cultivating a 100 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	16	18	96	97	98	205	429	486
Tractor specification:								
max. power required (kW)	52	60	70	76	81	88	100	129
Cultivator specification:								
no. of (blades/tines)/m	25	25	25	25	25	25	25	25
width (m)	2.000	3.000	3.000	3.500	4.000	4.500	4.000	3.000
actual speed (km/h)	3.59	3.59	4.02	4.02	4.02	4.48	6.28	6.72
actual work rate (ha/h)	0.57	0.86	0.96	1.13	1.29	1.61	2.01	1.61
Operating condition:								
start week no	41	41	40	40	41	40	41	41
start day no	281	281	274	274	281	274	281	281
no. of cult. days reqrd	21	14	12	11	9	7	6	7
expected finish day no	301	294	285	284	289	280	286	287
available work days	21	14	14	14	14	7	7	7
actual finish day no	301	294	285	284	289	280	286	287
non work days	0	0	0	0	0	0	0	0
actual finish week no	43	42	41	41	42	40	41	41
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	1851.66	2975.60	2975.60	3522.17	4099.54	4646.11	4099.54	2975.60
salvage value	769.80	1237.05	1237.05	1464.28	1704.31	1931.54	1704.31	1237.05
repair cost	8.89	14.29	14.29	16.91	19.68	22.31	19.68	14.29
present annual cost.	244.73	385.94	385.94	455.16	528.28	597.50	528.28	385.94
annual cash flow	204.36	328.40	328.40	388.72	452.44	512.76	452.44	328.40
insurance ($/yr)	31.91	33.37	33.37	36.45	39.70	42.78	39.70	33.37
shelter ($/yr)	18.52	29.76	29.76	35.22	41.00	46.46	41.00	29.76
fuel cost	992.29	755.21	807.30	748.47	705.26	594.74	541.78	871.21
labour cost	870.75	580.50	517.94	443.95	388.45	310.04	248.93	309.82
* Tractor ann.cost/cult.	468.91	361.34	376.73	350.85	327.35	284.02	259.35	416.90
Cultivation cost ($)	2674.54	2181.84	2187.48	2103.67	2061.16	1902.28	1683.15	2084.93

APPENDIX 4 cont'd

Table 12b Feasible 4-WD tractor (equal)-cultivator combinations for cultivating a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		16	18	96	97	98	205	429	486
Tractor specification:									
max. power required	(kW)	52	60	70	76	81	88	100	129
Cultivator specification:									
no. of (blades/tines)/m		25	25	25	25	25	25	25	25
width	(m)	2.000	3.000	3.000	3.500	4.000	4.500	4.000	3.000
actual speed	(km/h)	3.59	3.59	4.02	4.02	4.02	4.48	6.28	6.72
actual work rate	(ha/h)	0.57	0.86	0.96	1.13	1.29	1.61	2.01	1.61
Operating condition:									
start week no		42	41	42	41	41	41	41	41
start day no		288	281	288	281	281	281	281	281
no. of cult. days reqrd		43	29	25	22	19	15	12	15
expected finish day no		330	309	312	302	299	295	292	295
available work days		49	35	28	28	21	21	14	21
actual finish day no		330	309	312	302	299	295	292	295
non work days		0	0	0	0	0	0	0	0
actual finish week no		48	45	45	44	43	43	42	43
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1851.66	2975.60	2975.60	3522.17	4099.54	4646.11	4099.54	2975.60
salvage value		769.80	1237.05	1237.05	1464.28	1704.31	1931.54	1704.31	1237.05
repair cost		23.46	37.70	37.70	44.63	51.94	58.87	51.94	37.70
present annual cost.		250.62	395.41	395.41	466.37	541.32	612.28	541.32	395.41
annual cash flow		204.36	328.40	328.40	388.72	452.44	512.76	452.44	328.40
insurance	($/yr)	31.91	33.37	33.37	36.45	39.70	42.78	39.70	33.37
shelter	($/yr)	18.52	29.76	29.76	35.22	41.00	46.46	41.00	29.76
fuel cost		1984.58	1510.41	1614.61	1496.93	1410.56	1189.48	1083.57	1742.43
labour cost		1741.50	1161.00	1035.87	887.89	776.90	620.07	497.87	619.65
* Tractor ann.cost/cult.		937.32	722.69	753.46	701.69	654.70	565.04	518.69	833.30
Cultivation cost	($)	5059.62	3924.08	3935.35	3691.72	3526.39	3132.60	2770.36	3730.25

Table 13b Feasible 4-WD tractor (equal)-cultivator combinations for cultivating a 300 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.	16	18	96	97	98	205	429	486
Tractor specification:								
max. power required (kW)	52	60	70	76	81	88	100	129
Cultivator specification:								
no. of (blades/tines)/m	25	25	25	25	25	25	25	25
width (m)	2.000	3.000	3.000	3.500	4.000	4.500	4.000	3.000
actual speed (km/h)	3.59	3.59	4.02	4.02	4.02	4.48	6.28	6.72
actual work rate (ha/h)	0.57	0.86	0.96	1.13	1.29	1.61	2.01	1.61
Operating condition:								
start week no	42	41	42	41	41	41	41	41
start day no	288	281	288	281	281	281	231	281
no. of cult. days reqrd	65	43	38	33	29	23	18	23
expected finish day no	352	323	325	313	309	303	298	303
available work days	70	49	42	35	35	28	21	28
actual finish day no	352	323	325	313	309	303	298	303
non work days	0	0	0	0	0	0	0	0
actual finish week no	51	47	47	45	45	44	43	44
purchase age (yr)	0	0	0	0	0	0	0	0
present age (yr)	5	5	5	5	5	5	5	5
salvage age (yr)	5	5	5	5	5	5	5	5
Operational cost: ($)								
purchase price	1851.66	2975.60	2975.60	3522.17	4099.54	4646.11	4099.54	2975.60
salvage value	769.80	1237.05	1237.05	1464.28	1704.31	1931.54	1704.31	1237.05
repair cost	41.39	66.51	66.51	78.73	91.63	103.85	91.63	66.51
present annual cost.	257.87	407.05	407.05	480.15	557.37	630.47	557.37	407.05
annual cash flow	204.36	328.40	328.40	388.72	452.44	512.76	452.44	328.40
insurance ($/yr)	31.91	33.37	33.37	36.45	39.70	42.78	39.70	33.37
shelter ($/yr)	18.52	29.76	29.76	35.22	41.00	46.46	41.00	29.76
fuel cost	2976.87	2265.62	2421.91	2245.40	2115.84	1784.22	1625.35	2613.64
labour cost	2612.25	1741.50	1553.81	1331.84	1165.36	930.11	746.30	929.47
* Tractor ann.cost/cult.	1406.73	1084.03	1130.19	1052.54	982.05	852.06	773.04	1250.70
Cultivation cost ($)	7446.46	5668.49	5635.41	5282.35	4994.62	4366.31	3360.57	5377.76

APPENDIX 4 cont'd

Table 14b Feasible 4-WD tractor (equal)-drill combinations for drilling a 100 ha at 80% field efficiency, a soil workablitiy criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		16	18	96	97	93	205	429	436
Tractor specification:									
max. power required	(kW)	52	60	70	76	81	83	100	129
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		25	35	30	35	40	40	55	40
width	(m)	2.500	3.500	3.000	3.500	4.000	4.000	5.500	4.000
actual speed	(km/h)	4.49	4.49	4.47	4.47	4.47	4.48	4.48	4.48
actual work rate	(ha/h)	0.90	1.26	1.07	1.25	1.43	1.43	1.97	1.43
Operating condition:									
start week no		42	42	42	42	42	42	42	42
start day no		288	288	288	288	288	288	288	288
no. of drilling days		13	9	11	9	8	8	6	8
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		300	296	298	296	295	295	293	295
available work days		14	14	14	14	14	14	7	14
non work days		0	0	0	0	0	0	0	0
actual finish day no		300	296	298	296	295	295	293	295
actual finish week no		43	43	43	43	43	43	42	43
average early loss	(%)	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947
average late loss	(%)	0.0232	0.0000	0.0058	0.0000	0.0000	0.0000	0.0000	0.0000
average crop loss	(%)	0.1179	0.0947	0.1005	0.0947	0.0947	0.0947	0.0947	0.0947
average crop yield	(t/ha)	6.1927	6.1941	6.1938	6.1941	6.1941	6.1941	6.1941	6.1941
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1689.67	3253.27	2471.47	3253.27	4035.07	4035.07	6380.47	4035.07
salvage value		702.45	1352.49	1027.47	1352.49	1677.51	1677.51	2652.57	1677.51
repair cost		13.79	26.55	20.17	26.55	32.92	32.92	52.06	32.92
present annual cost		224.72	421.16	322.22	421.15	520.19	520.19	817.26	520.19
annual cash flow		186.43	359.04	272.76	359.04	445.33	445.33	704.13	445.33
fuel cost		635.07	517.86	726.57	673.62	634.75	669.08	551.63	980.11
insurance	($/yr)	31.91	34.93	31.91	34.93	39.34	39.34	52.56	39.34
shelter	($/yr)	16.90	32.53	24.71	32.53	40.35	40.35	63.80	40.35
labour cost		557.28	398.06	466.14	399.55	349.61	348.79	255.46	348.55
* Tractor ann.cost/drill		300.10	247.78	339.05	315.76	294.62	319.52	264.06	469.01
Drilling cost	($)	1796.34	1676.81	1943.47	1907.78	1905.84	1967.35	2027.32	2440.22
Yield loss cost	($)	73.11	58.73	62.32	58.73	58.73	58.73	58.73	58.73
Total operation cost	($)	7651.43	7104.72	7256.90	7100.89	6552.75	7153.51	6693.37	7494.39

APPENDIX 4 cont'd

Table 15a Feasible 4-WD tractor (equal)-drill combinations for drilling a 200 ha at 80% field efficiency, a soil workability criterion of 110% and probability level of 90% (a soil series Winton).

Single combination no.		16	18	96	97	98	205	429	430
Tractor specification:									
max. power required	(kW)	32	60	70	76	81	88	100	129
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		25	35	30	35	40	40	55	40
width	(m)	2.500	3.500	3.000	3.500	4.000	4.000	5.500	4.000
actual speed	(km/h)	4.49	4.49	4.47	4.47	4.47	4.48	4.43	4.43
actual work rate	(ha/h)	0.90	1.26	1.07	1.25	1.43	1.43	1.97	1.45
Operating condition:									
start week no		41	41	41	41	41	41	42	41
start day no		281	281	281	281	281	281	288	231
no. of drilling days		27	19	23	19	17	17	12	17
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		307	299	303	299	297	297	299	297
available work days		28	21	28	21	21	21	14	21
non work days		0	0	0	0	0	0	0	0
actual finish day no		307	299	303	299	297	297	299	297
actual finish week no		44	43	44	43	43	43	43	43
average early loss	(%)	0.3330	0.3330	0.3330	0.3330	0.3330	0.3330	0.0947	0.3330
average late loss	(%)	0.1755	0.0131	0.0711	0.0131	0.0014	0.0014	0.0131	0.0014
average crop loss	(%)	0.5084	0.3460	0.4040	0.3460	0.3344	0.3344	0.1978	0.3344
average crop yield	(t/ha)	6.1685	6.1785	6.1749	6.1785	6.1793	6.1793	6.1933	6.1793
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1689.07	3253.27	2471.47	3253.27	4035.07	4035.07	6350.47	4035.07
salvage value		702.45	1352.49	1027.47	1352.49	1677.51	1677.51	2652.57	1677.51
repair cost		85.11	163.87	124.40	163.87	203.24	203.24	321.36	203.24
present annual cost		241.83	454.10	347.31	454.10	561.04	561.04	881.36	561.04
annual cash flow		186.48	359.04	272.76	359.04	445.33	445.33	704.12	445.33
fuel cost		1270.13	1035.71	1453.15	1347.24	1269.50	1338.17	1103.27	1969.25
insurance	($/yr)	31.91	34.93	31.91	34.93	39.34	39.34	52.56	39.34
shelter	($/yr)	16.90	32.53	24.71	32.53	40.35	40.35	63.80	40.35
labour cost		1114.56	796.12	932.28	799.10	699.21	697.58	506.92	697.10
* Tractor ann.cost/drill		600.20	495.56	678.11	631.52	589.23	639.04	523.12	933.03
Drilling cost	($)	3336.25	2897.94	3533.07	3359.69	3254.66	3375.68	3185.62	4321.42
Field loss cost	($)	630.48	429.11	501.02	429.11	414.71	414.71	135.64	414.71
Total operation cost	($)	15362.40	13346.68	13164.70	12604.37	12247.81	12457.14	11937.92	14258.42

APPENDIX 4 cont'd

Table 16b Feasible 4-WD tractor (equal)-drill combinations for drilling a 300 ha at 80% field efficiency a soil workability criterion of 110% and probability level of 90% (soil series Winton).

Single combination no.		16	18	96	97	98	205	429	486
Tractor specification:									
max. power required (kW)		52	60	70	76	81	88	100	129
Drill specification:									
coulter width	(m)	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
number of coulters		25	35	30	35	40	40	55	40
width	(m)	2.500	3.500	3.000	3.500	4.000	4.000	5.500	4.000
actual speed	(km/h)	4.49	4.49	4.47	4.47	4.47	4.48	4.48	4.45
actual work rate	(ha/h)	0.90	1.26	1.07	1.25	1.43	1.43	1.97	1.43
Operating condition:									
start week no		40	41	40	41	41	41	41	41
start day no		274	281	274	281	281	281	281	281
no. of drilling days		41	29	34	29	26	26	19	26
optimum day no		296	296	296	296	296	296	296	296
expected finish day no		314	309	307	309	306	306	299	306
available work days		42	35	35	35	28	28	21	28
non work days		0	0	0	0	0	0	0	0
actual finish day no		314	309	307	309	306	306	299	306
actual finish week no		45	45	44	45	44	44	43	44
average early loss	(%)	0.7163	0.3330	0.7163	0.3330	0.3330	0.3330	0.3330	0.3330
average late loss	(%)	0.4698	0.2451	0.1755	0.2451	0.1450	0.1450	0.0131	0.1450
average crop loss	(%)	1.1861	0.5781	0.5918	0.5781	0.4780	0.4780	0.3460	0.4780
average crop yield (t/ha)		6.1265	6.1642	6.1447	6.1642	6.1704	6.1704	6.1785	6.1704
purchase age	(yr)	0	0	0	0	0	0	0	0
present age	(yr)	5	5	5	5	5	5	5	5
salvage age	(yr)	5	5	5	5	5	5	5	5
Operational cost:	($)								
purchase price		1889.67	3253.27	2471.47	3253.27	4035.07	4035.07	6380.47	4035.07
salvage value		702.45	1352.49	1027.47	1352.49	1677.51	1677.51	2652.57	1677.51
repair cost		246.82	475.23	361.03	475.23	589.43	589.43	932.04	589.43
present annual cost		280.63	528.80	404.05	528.80	653.69	653.69	1028.35	653.69
annual cash flow		186.48	359.04	272.76	359.04	445.33	445.33	704.18	445.33
fuel cost		1905.20	1553.57	2179.72	2020.86	1904.26	2007.25	1654.90	2940.34
insurance	($/yr)	31.91	34.93	31.91	34.93	39.34	39.34	52.56	39.34
shelter	($/yr)	16.90	32.53	24.71	32.53	40.35	40.35	63.30	40.35
labour cost		1671.84	1194.17	1398.43	1198.65	1043.82	1046.38	760.38	1045.65
* Tractor ann.cost/drill		900.31	743.33	1017.17	947.29	883.85	958.56	792.19	1407.04
Drilling cost	($)	4897.86	4160.82	5154.33	4853.74	4654.27	4335.80	4425.81	6254.41
Field loss cost	($)	2206.12	1075.17	1653.69	1075.17	889.08	889.08	643.66	889.08
Total operation cost	($)	23645.54	19639.11	19857.49	18462.37	17682.14	17958.53	17207.67	20759.35

APPENDIX 4 cont'd

Table 17b 4-WD tractor (equal)-plough combination cost details for used hours in table 8.10.

Single combination no.	16	18	96	97	98	205	429	486
front axle load (kN)	23.36	23.36	32.53	32.53	32.53	38.75	47.48	50.23
rear axle load (kN)	22.93	22.93	34.27	34.27	34.27	39.31	47.45	49.41
tractor power reqrd (kW)	52	60	70	76	81	88	100	127
Plough bodies	4	4	7	7	7	7	8	8
Finance:								
loan interest rate	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
investment interst rate	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
tax rate	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
inflation rate	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Tractor:								
purchase price ($)	15622.84	18074.76	21139.66	22978.60	24511.05	26656.48	30334.36	39222.57
purchase age (yr)	0	0	0	0	0	0	0	0
salvage price ($)	5959.13	6894.38	8063.45	8764.89	9349.42	10167.77	11570.65	14960.94
sale age (yr)	5	5	5	5	5	5	5	5
road tax ($)	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
insurance ($)	101.17	111.93	125.40	133.47	140.21	149.63	165.79	204.82
shelter ($)	156.23	180.75	211.40	229.79	245.11	266.56	303.34	392.23
annual hours (h)	1000	1000	1000	1000	1000	1000	1000	1000
ploughing hours (h)	132	116	122	114	106	113	107	87
repair by ploughing (a%)	1.53	1.34	1.42	1.32	1.23	1.31	1.24	1.00
repair by tillage (a%)	5.55	4.07	3.81	3.37	3.02	2.74	2.39	2.44
repair(% purchase price)	11.54	11.54	11.54	11.54	11.54	11.54	11.54	11.54
repair by ploughing ($)	305.25	309.01	382.69	386.27	384.56	447.05	478.99	503.28
repair by tillage ($)	1106.51	927.02	1027.60	987.14	945.38	933.84	923.77	1219.05
annual repair cost ($)	2300.51	2661.56	3112.88	3383.67	3609.32	3925.29	4466.82	5775.64
ann cost by ploughing($)	357.26	361.34	447.11	451.09	448.94	521.67	558.59	586.27
ann cost by tillage ($)	1295.08	1084.03	1200.57	1152.78	1103.64	1089.70	1077.29	1420.07
annaul cost ($)	2692.56	3112.34	3636.84	3951.46	4213.53	4580.39	5209.14	6728.02
annual cash flow ($)	1825.41	2111.90	2470.01	2684.87	2863.93	3114.60	3544.34	4582.85
Plough:								
purchase price ($)	1815.49	1815.49	3294.38	3294.38	3294.38	3294.38	3787.33	3787.33
purchase age (yr)	5	5	5	5	5	5	5	5
salvage price ($)	754.76	754.76	1369.58	1369.58	1369.58	1369.58	1574.52	1574.52
sale age (yr)	5	5	5	5	5	5	5	5
insurance ($/yr)	31.91	31.91	35.16	35.16	35.16	35.16	37.94	37.94
shelter cost ($/yr)	18.15	18.15	32.94	32.94	32.94	32.94	37.87	37.87
repair(% purchase price)	1.64	1.64	3.41	3.41	3.41	3.41	3.41	3.41
repair cost ($)	37.95	37.95	143.44	143.44	143.44	143.44	164.90	164.90
annual cost ($)	249.02	249.02	466.35	466.35	466.35	466.35	534.77	534.77
annual cash flow ($)	200.37	200.37	363.58	363.58	363.58	363.58	417.99	417.99

a % of purchase price.

APPENDIX 5

MACHINERY SELECTION PROGRAMME

1. COMMON BLOCKS

```
c     System and user common block.
c
      COMMON/SUBLK /SUREC,MAXSU,SURL,VDU,COLSTT,ROWSTT,COLSDK,ROWSDK,
     &              COL,ROW,LUTT,LUDK,LUDA,LURT,OUTDEV,OPENED,PAGENO,
     &              RUNNO,PROG,USER,TITLE,HHMMSS,DDMMYY,COMAND,RPORTS,
     &              CHOICE,LUCALC
c
c     Report common block
c
      COMMON/RTBLK /RTREC,MAXRT,RTRL,DATASY,REPORT
c
c     Tractor common block.
c
      COMMON/A00BLK/A00REC,A01REC,MAXA01,A01RL,A02REC,MAXA02,A02RL,
     &              A03REC,MAXA03,A03RL,
     &              TYPE,
     &              TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &              FLDD,WBAS
c
c     Plough common block.
c
      COMMON/C00BLK/C00REC,C01REC,MAXC01,C01RL,C02REC,MAXC02,C02RL,
     &              C03REC,MAXC03,C03RL,C04REC,MAXC04,C04RL,
     &              C05REC,MAXC05,C05RL,
     &              MINPBS,MAXPBS,PANGLE,IAAP,IPAGE,IAAS
c
c     Mounted drill common block.
c
      COMMON/F00BLK/F00REC,F01REC,MAXF01,F01RL,F02REC,MAXF02,F02RL,
     &          MINDNR,MAXDNR,INCDNR,MINDW,MAXDW,INCDW,DDEPTH,MINDSP,
     &             MAXDSP,INCDSP,DAAP,DPAGE,DAAS
c
c     Cultivator common block.
c
      COMMON/I00BLK/I00REC,MAXI00,I00RL,
     &        CNF,MINCFW,MAXCFW,INCCFW,CDEPTH,
     &        MINCSP,MAXCSP,INCCSP,CAAP,CPAGE,CAAS
c
c     Soil specification common block.
c
      COMMON/SSBLK /SSREC,MAXSS,SSRL,SSNAME,PCLAY,PSILT,PSAND,PHUMUS,
     &              FC,MCWW,MCFC,SBD,DRSAT,DRFC,SLQWW,SLQFC,SPLWW,
     &              SPLFC,SWPWW,SWPFC,WABY,SKC,SKF,SCR
c
c     Operating conditions common block.
c
      COMMON/OCBLK /OCREC,MAXOC,OCRL,SWNO,CWNO,FE,PROB,AREA,MINPS,
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     &             MAXPS,INCPS,MINPCD,MAXPCD,INCPCD,PLSDAY,PLCDAY,
     &             TTUSEH,TAAP,TPAGE,TAAS
c
c     Additional costs common block.
c
      COMMON/ACBLK /ACREC,MAXAC,ACRL,INTR,INFR,INVR,TAXR,FCOSTL,LCOSTH,
     &            TSHCY,IMSHCY,TTAXCY,CROPNE,CROPVT
c
c     Combination selection common block.
c
      COMMON/CSBLK /CSREC,MAXCS,CSRL,NA01RS,A01R,A02R,A03R,AOR,
     &            NC01RS,C01R,NSSRS,SSR,NOCRS,COR,NACRS,ACR,
     &            NF01RS,F01R,NIOORS,IOOR,
     &             NA02RS,NA03RS,TWOWD,UNE4,EQ4W
c
c     Technical and financial calculations common block.
c
      COMMON/CALBLK/PCD,PS,RUN,G,RUNS,PCW,SSW,CI,WDLD,TWT,RWW,TRSH,JJJ,
     &             TRDF,TRD,WMN,WSLIP,APS,CTMAX,RK,CRR,CT,TE,PD,RRF,J6,
     &             PPR,APR,APULL,TPULL,DBKW,TPOWER,TRATIO,TR,SPWEEK,
     &             LUDA1,LUDA2,LUDA3,LUDA4,LUDA5,LUDA6,IIII1,FTDH,LL,
     &             PDAYSW,PAREA,TAPR,NOTR,PHOURS,FTTH,SINE,TDANC,LLL,
     &             TTILLH,FTPH,PBS,SWEEKN,SPDAYS,PWDAYS,DNR,EXFPWN,
     &             TLIFE,N,TWEARH,ILIFE,N1,N4,K5,K6,N2,TPP,PPP,FL,A1,
     &             B1,TSALV,A2,B2,PSALV,IT,IW,X,XX,XXX,TREPC,TTREPC,
     &             IP,IZ,Z,PREPC,SUM,TPANC,TTPANC,SUM1,PPANC,TFILE,
     &             TACF,PACF,TFUCT,TLCOST,DAYS,PDAYS,ADSP,PTOR,PTOKW,
     &             PSHTCY,DSHTCY,CSHTCY,TDREPC,TCREPC,TPRCC,AOREC,JJ2,
     &             TSHTCY,FTORC,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
     &             TNPMV,PNPMV,SUM51,SUM52,TBC,PBC,SUM61,SUM62,CCAV,
     &             CMORTV,CAINTC,CNPMV,SUM71,SUM72,CBC,DCAV,DMORTV,J7,
     &            DAINTC,DNPMV,SUM81,SUM82,DBC,SUM50,SUM60,SUM70,SUM80
      COMMON/CALBLK/PWEEKS,MAXY,AVRLOS,YLCASH,OPCOST,TSCOST,PTOP,PTORA,
     &             TPREPC,TPPANC,WDAYS,WEEKNO,SUM2,TOTALS,MAXTEP,TWR,
     &             ELOSS,DLOSS,AVERY,PCDAYN,PERHR,CPA,OPTDN,CPB,PWWN,
     &             BODIES,IDD,ID,SUM4,SUM5,YLCCOT,CWWN,CWDAYS,PDAYSR,
     &             TCCOST,DRBKW,YLOSSC,DRW,DSP,ADR,TSLIP,DPP,DFUCT,
     &             DSALV,DREPC,SUM3,DPANC,DACF,SDAYN,CDAYN,CPDAYN,
     &             SSDN,OPDAYS,DHOURS,ENGINE,SSWNO,FPDAYN,RPDS,RDDS,
     &             LUDA7,IDDD,JSSS,DRWW,TCAPR,PDAYNO,RCDS,SWWN,MKJ,
     &             DLCOST,DRCOST,PSS,PBSS,PCDS,PSNO,PBSNO,PCDNO,MK,
     &             MINPD,MAXPD,INCPD,NCULC,III,II1,CDDWS,DAWDAY,JSS,JS,
     &             CFW,CWIDTH,ACSP,ACWR,CHOURS,FTCH,CPP,CSALV,KKK,IIII,
     &             CREPC,CPANC,TCANC,CACF,CFUCT,CLCOST,CULCT,ADWDN,
     &             CULSDN,CULFDN,CULWD,CWEEKN,PCWEEK,CPDAYS,FCULDN,
     &             LUDA9,LUDA10,LUDA8,MMM,M5,M6,CULTIV,CTCOST,KB,KBB,
     &             SUM11,SUM12,SUM13,SUM21,SUM22,SUM23,SUM31,SUM32,
     &             SUM33,SUM41,SUM42,SUM43,TINP,PINP,CINP,DINP,TRSALV,
     &             PRSALV,CRSALV,DRSALV,TINSCY,PINSCY,CINSCY,DINSCY
      COMMON/CALBLK/FWLD,FWW,FTSH,FTDF,FWD,BF,BR,WF,WR,FMN,FSLIP,
     &             RSLIP,CRRF,RRR,CTMAXF,FK,CTF,TMAXF,TMAXR,TMAX,
     &             TF1,TR2,TFR,TQ,PWT,PTWT,K2,J2,J3,J4,
     &             MM,NN,II,JJ1
c
c     Declare integer variables.
c
      INTEGER I,J,K,L,M,N,N4,N2,NDAR,NRSR,ERROR,LUCALC,PWWN,CWWN,SWWN,
     &        SUREC,MAXSU,SURL,VDU,COLSTT,ROWSTT,COLSDK,ROWSDK,PDAYSR,
     &        COL,ROW,LUTT,LUDK,LUDA,LURT,PAGENO,RUNNO,RPORTS,LL,LLL,
     &        RTREC,MAXRT,RTRL,DDAAP,DDPAGE,DDAAS,MINDNR,MAXDNR,JJ2,
```

```
  &    RPDS,RCDS,RDDS,RRPDS,RRCDS,RRDDS,MKJ,MK,CDDWS,AVWDAY,
  &    A00REC,A01REC,MAXA01,A01RL,A02REC,MAXA02,A02RL,CULTIV,
  &    A03REC,MAXA03,A03RL,A0REC,A01R,A02R,A03R,A0R,CWDAYS,
  &    B00REC,B01REC,MAXB01,B01RL,EXFPDN,EXFDDN,EXFPWN,ADWDN,
  &    C00REC,C01REC,MAXC01,C01RL,C02REC,MAXC02,C02RL,
  &    C03REC,MAXC03,C03RL,C04REC,MAXC04,C04RL,
  &    C05REC,MAXC05,C05RL,NCULC,INCDNR,DAWDAY,DDAWD,
  &    F00REC,F01REC,MAXF01,F01RL,F02REC,MAXF02,F02RL,
  &    SSREC,SSRL,MAXSS,
  &    OCREC,OCRL,MAXOC
   INTEGER  ACREC,ACRL,MAXAC,
  &    CSREC,CSRL,MAXCS,
  &    RUN,TAAP,TPAGE,TAAS,FE,IAAP,IPAGE,IAAS,MINPBS,MAXPBS,
  &    WABY,SWNO,CWNO,PROB,DAYS,WDAYS,PDAYS,II,III,JJJ,JJ1,
  &    NOTR,J3,J4,JJ,N1,WEEKNO,PWEEKS,PBS,RUNS,TLIFE,ILIFE,
  &    K1,J1,K2,K3,K4,II1,J2,KK1,MM,NN,KK,PDAYSW,SWEEKN,SPWEEK,
  &    PDAY,FWEEK,PBODY,PURAGE,SALAGE,TYHOUR,TPLHR,PPAGE,SPDAYS,
  &    PSALEG,WORKAB,PROBAL,TDAYS,IFIELD,NA01RS,NF01RS,F01R,
  &    NA02RS,NA03RS,
  &    NC01RS,C01R,NSSRS,SSR,NOCRS,OCR,NACRS,ACR,PWDAYS,
  &    LUDA1,LUDA2,LUDA3,LUDA4,LUDA5,LUDA6,SDAYN,OPTDN,CDAYN,
  &    PCDAYN,SDAYNO,OPTDNO,CDAYNO,PCDAYS,LUDA7,DAAP,DPAGE,
  &    IIII1,KB,KBB,JS,JSS,JSSS,ID,IDD,IDDD,DAAS,CPDAYN,SSWNO,
  &    KKK,IIII,ANOTR,BODIES,PLSDAY,PLCDAY,OPDAYS,SSDN,FPDAYN,
  &    PSDAYN,SSWKNO,DPDAYS,DFDAYN,DFWKNO,ENGINE,MAXEP,
  &    SCOMBN,PDAYNO,DDDNR,DNR,PSS,PBSS,PCDS,PSNO,PBSNO,PCDNO,
  &    COUNT,MINPD,MAXPD,INCPD,SINE,LUDA9,LUDA10
   INTEGER I00REC,MAXI00,I00RL,NI00RS,I00R,LUDA8,
  &    CNF,CAAP,CPAGE,CAAS,J5,J6,J7,K5,
  &    M5,M6,K6,MMM,CULSDN,CULFDN,CULWD,CWEEKN,PCWEEK,
  &    CPDAYS,FCULDN,CCNF,CCULSD,CCULFD,CCWNO,CCPDS,FCCLDN,
  &    CULSWN,CCAAP,CCPAGE,CCAAS
c
c  Declare real variables.
c
   REAL OUTDEV,OPENED,PROG,USER,TITLE,HHMMSS,DDMMYY,COMAND,CHOICE,
  &    RARRAY,QUERY,SU,RT,TT,SS,OC,AC,CS,DK,RN,EX,YES,NO,TAXR,TWR,
  &    DATASY,REPORT,TYPE,TWOWD,UNE4,DDREPC,DDPANC,DDACF,DDSALV,
  &    MB,C,S,R,T,MGDR,DSDR,DDPP,SBD,DFUCT,DRCOST,DLCOST,DDEPTH,
  &    IW,IZ,G,TWEARH,PAREA,CROPNE,TPDYCT,LOSSES,FTDH,INVRES,
  &    TNAME,TCOST,RWLD,TRW,RMD,TINFP,TFUC,MINPCD,MAXPCD,INCPCD,
  &    MAXPS,INCPS,PANGLE,PCLAY,PSILT,PSAND,PHUMUS,FC,MCWW,MCFC,
  &    DRSAT,DRFC,SLQWW,SLQFC,SPLWW,SPLFC,SWPWW,SWPFC,AREA,INTR,
  &    FCOSTL,LCOSTH,TSHCY,IMSHCY,TTAXCY,CPA,CPB,CROPVT,TPRCC,
  &    PCD,PS,PCW,SSW,CI,WDLD,TWT,RWW,TRSH,TRDF,TRD,WMN,WSLIP,APS,
  &    CTMAX,RK,CRR,CT,TE,PD,RRF,PPR,APR,FTTH,APULL,TPULL,DBKW,TR,
  &    TPOWER,TRATIO,TPP,PPP,FL,A1,B1,TSALV,A2,B2,PSALV,X,TREPC,
  &    TTREPC,PHOURS,IP,Z,PREPC,SUM,TPANC,TTPANC,SUM1,PPANC,TACF,
  &    TSHTCY,PSHTCY,DSHTCY,CSHTCY,EQ4W,TFILE,MAXTEP,PTOFF,
  &    DSHLET,CSHLET,FTORC,INVR
   REAL  PACF,TFUCT,TLCOST,MAXY,AVRLOS,YLCASH,OPCOST,TSCOST,ADSP,
  &    MINPS,INFR,TTILLH,FTPH,TPREPC,XX,XXX,TPPANC,TAPR,SUM2,DDRW,
  &    TOTALS,PERHR,TRKW,TRWT,KGKWR,MAXAP,WDLOAD,TMPULL,RIMD,TRSW,
  &    DRAWBP,RFORCE,PDRAFT,PFSP,PWIDTH,PDEPTH,SSPW,CONEIN,MCONT,
  &    TPRICE,PPRICE,TANNC,PANNC,TPANNC,FUELC,LABOUR,YLOSSC,OTHERC,
  &    COMCOT,FCAPY,INTRES,INFLAR,TSALE,TAX,INSURA,TSHELT,DRATE,
  &    TPX,TPXX,TPXXX,XREP,XXREP,XXXREP,TTANNC,TCASHF,PSALE,PSHELT,
  &    PPREPC,PYREPC,PCASHF,TINPRE,APRATE,WS,ESCAPD,ELOSS,DLOSS,
  &    NIAEPD,SPD,FILNAM,SSNAME,SKC,SKF,SCR,AVERY,PLOSS,PYIELD,
  &    IT,TTUSEH,SUM4,SUM5,YLCCOT,TCCOST,DRBKW,DRW,DSP,ADR,TSLIP,
```

```
     &     MINDW,MAXDW,INCDW,MINDSP,MAXDSP,INCDSP,TDDR,DPP,DSALV,
     &     DREPC,SUM3,DPANC,DACF,DHOURS,DDSP,DRWW,TCAPR,DDDRW,TDANC,
     &     EELOSS,DDLOSS,DDFUCT,DLABOR,CDCOST
      REAL  MINCSP,MAXCSP,INCCSP,CDEPTH,CSP,CWIDTH,ACSP,ACWR,
     &     CHOURS,FTCH,CPP,CSALV,CREPC,CPANC,TCANC,CACF,CFUCT,CLCOST,
     &     CULCT,CCFW,CCWTH,ACCSP,ACCWR,CCHOUR,FTCCH,CCPP,CCSALV,
     &     CCREPC,CCPANC,TCCANC,CCACF,CCFUCT,CCLCOT,CULCOT,MINCFW,
     &     MAXCFW,INCCFW,PTOR,PTORA,PTOKW,PTOP,CFW,
     &     SUM11,SUM12,SUM13,SUM21,SUM22,SUM23,SUM31,SUM32,SUM33,SUM41,
     &     SUM42,SUM43,TINP,PINP,CINP,DINP,TRSALV,PRSALV,CRSALV,DRSALV,
     &     TINSCY,PINSCY,CINSCY,DINSCY,PINSUR,DRINSUR,CINSUR,
     &     TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,TNPMV,PNPMV,SUM51,
     &     SUM52,TBC,PBC,SUM61,SUM62,CCAV,CMORTV,CAINTC,CNPMV,CBC,
     &     SUM71,SUM72,DCAV,DMORT,DAINTC,DNPMV,DBC,SUM81,SUM82,SUM50,
     &     SUM60,SUM70,SUM80,FTW,FRD,FINFP,FLDD,WBAS,
     &     FWLD,FWW,FTSH,FTDF,FWD,BF,BR,WF,WR,FMN,FSLIP,RSLIP,CRRF,
     &     RRR,CTMAXF,FK,CTF,TMAXF,TMAXR,TMAX,TF1,TR2,TFR,TQ,PWT,
     &     FFWLD,FFTW,FFTSH,FFTDF,FFRD,FFINFP,FWF,RWR,FFMN,FFSLIP,
     &     RRSLIP,FCRRF,RRRR,CTMF,FFK,CTFF,TMAXFF,TMAXRR,TTMAX,
     &     TFF,TRR,TTFR,TTQ,PLWT,TTWT,PTWT
c
c     Declare array dimensions.
c
      DIMENSION PROG(3),USER(5),TITLE(5),HHMMSS(2),DDMMYY(3),PWWN(500),
     &          RARRAY(26),CHOICE(15),REPORT(12),TCAPR(500),TSILP(500),
     &          TNAME(4),SSNAME(4),CROPNE(4),FILNAM(4),DDSP(10),X(500),
     &          WDAYS(52),PERHR(500),TRKW(10),TRWT(10),KGKWR(10),
     &          WDLOAD(10),TMPULL(10),RIMD(10),TINPRE(10),DFDAYN(10),
     &          RFORCE(10),PDRAFT(10),PBODY(10),PFSP(10),DDRW(10),
     &          FWEEK(10),PDAY(10),SSPW(10),CONEIN(10),PSDAYN(10),
     &          WORKAB(10),PROBAL(10),TPRICE(10),PPRICE(10),SSWKNO(10),
     &          TPANNC(10),FUELC(10),LABOUR(10),YLOSSC(500),DPDAYS(10),
     &          COMCOT(10),INTRES(10),INFLAR(10),ENGINE(500),DDSALV(10),
     &          TSALE(10),SALAGE(10),TAX(10),INSURA(10),DFWKNO(10),
     &          TPLHR(10),TPX(10),TPXX(10),TPXXX(10),XREP(10),DDAAP(10),
     &          XXXREP(10),TTANNC(10),TCASHF(10),PPAGE(10),DDREPC(10),
     &          PSALEG(10),PSHELT(10),PPREPC(10),PYREPC(10),DDACF(10)
      DIMENSION  MAXAP(10),PDEPTH(10),TYHOUR(10),PCASHF(10),DDPP(10),
     &          DRATE(10),WS(10),TDAYS(4),IFIELD(4),DDDRW(10),DDDNR(10),
     &          DRAWBP(10),PWIDTH(10),MCONT(10),TANNC(10),DDPANC(10),
     &          OTHERC(10),PURAGE(10),TSHELT(10),DDPAGE(10),TFUCT(500),
     &          PSALE(10),PANNC(10),APRATE(10),F01R(20),A01R(20),
     &          A02R(20),A03R(20),TFILE(3),PTOFF(10),CWWN(500),
     &          C01R(20),SSR(20),OCR(20),ACR(20),TRSW(10),DDAAS(10),
     &          PLOSS(10),PYIELD(10),SDAYNO(10),OPTDNO(10),EELOSS(10),
     &          PCDAYS(10),NOTR(500),PHOURS(500),FTTH(500),DDLOSS(10),
     &          TTILLH(500),FTPH(500),XXREP(10),DDFUCT(10),DLABOR(10),
     &          CDAYNO(10),FCAPY(10),BODIES(500),ANOTR(10),DRCOST(500),
     &          YLCCOT(500),TCCOST(500),DRBKW(500),TOTALS(500),
     &          MAXEP(10),SCOMBN(10),FPDAYN(500),RUN(500),TSLIP(500),
     &          CDCOST(10),LOSSES(10),TRPLCT(10),TPDYCT(10),SINE(500),
     &          TPANC(500),TDANNC(10),EXFPDN(10),EXFDDN(10),SWWN(500)
      DIMENSION IOOR(20),PTOP(500),PTORA(500),FTORC(500),INVRES(10),
     &          CCFW(10),CCNF(10),CCWTH(10),ACCSP(10),ACCWR(10),
     &          FTCCH(10),CCHOUR(10),CCPP(10),CCSALV(10),CCREPC(10),
     &          CCPANC(10),TCCANC(10),CCACF(10),CCFUCT(10),CCLCOT(10),
     &          CCULSD(10),CCULFD(10),CCWNO(10),CCPDS(10),FCULDN(500),
     &          FCCLDN(10),CULCOT(10),CULCT(500),CULSWN(10),CCAAP(10),
     &          CCPAGE(10),CCAAS(10),CINSUR(10),DINSUR(10),PINSUR(10),
     &          TINP(500),PINP(500),CINP(500),DINP(500),TRSALV(500),
```

```
     &         PRSALV(500),CRSALV(500),DRSALV(500),TPRCC(500),
     &         DSHELT(10),CSHELT(10),TDREPC(500),TCREPC(500),
     &         FFWLD(10),FFTW(10),FFTRSH(10),FFTDF(10),FFRD(10),
     &         FFINFP(10),FWF(10),RWR(10),FFMN(10),FFSLIP(10),
     &         RRSLIP(10),FCRRF(10),RRRR(10),CTMF(10),FFK(10),
     &         CTFF(10),TMAXFF(10),TMAXRR(10),TTMAX(10),TFF(10),
     &         TRR(10),TTFR(10),TTQ(10),PLWT(10),TTWT(10),AOR(20),
     &         RPDS(500),RCDS(500),RDDS(500),RRPDS(10),RRCDS(10),
     &         RRDDS(10),AVWDAY(10),DAWDAY(500),DDAWD(10)
c
c     Initialise variables.
c
      DATA QUERY /'?   '/,SU    /'SU  '/,RT    /'RT  '/,
     &     SS    /'SS  '/,OC    /'OC  '/,AC    /'AC  '/,CS    /'CS  '/,
     &     TT    /'TT  '/,DK    /'DK  '/,RN    /'RN  '/,EX    /'EX  '/,
     &     YES   /'Y   '/,NO    /'N   '/,
     &     TWOWD /'2WD '/,UNE4  /'UNE4'/,EQ4W  /'EQ4W'/,
     &     MB    /'MB  '/,C     /'C   '/,S     /'S   '/,R     /'R   '/,
     &     T     /'T   '/,MGDR  /'MGDR'/,DSDR  /'DSDR'/
```

APPENDIX 5 cont'd

2. INITIALISE DATA

```
c
      CALL MSDI
c
   10 CONTINUE
c
c     Take a new page.
c
      CALL NEW(LUTT)
c
c     Write program header.
c
      CALL NDUT(LUTT,COLSTT,PROG,DDMMYY,USER,TITLE)
c
c     Initialise page number.
c
      PAGENO = 0
c
   20 CONTINUE
c
c     Command level menu.
c
      CALL MSCL
c
      IF (COMAND.EQ.RN) GOTO 30
      IF (COMAND.EQ.EX) GOTO 60
c
c     Enter data systems.
c
      CALL MSDSEC
      GOTO 20
c
   30 CONTINUE
c
c     Open reports listing file.
c
      IF (OUTDEV.EQ.TT ) GOTO 40
      IF (OPENED.EQ.YES) GOTO 40
c
      OPEN(UNIT=LURT,NAME='MSP.LIS',TYPE='NEW',DISPOSE='SAVE',
     &     ACCESS='SEQUENTIAL',CARRIAGECONTROL='FORTRAN',
     &     FORM='FORMATTED')
c
      OPENED=YES
c
   40 CONTINUE
c
c     Read data for this run into memory.
c
c      CALL MSDM
c
c     Write data summary.
c
c      IF (DATASY.EQ.YES) CALL MSSY
c
c     Open technical and financial calculations results file.
```

```
c
      OPEN(UNIT=5,NAME='MSCALC5.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
      OPEN(UNIT=6,NAME='MSCALC6.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
      OPEN(UNIT=7,NAME='MSCALC7.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
      OPEN(UNIT=8,NAME='MSCALC8.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
      OPEN(UNIT=9,NAME='MSCALC9.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
c     Calculate technical and financial results.
c
      CALL MSCALC
c
   50 CONTINUE
c
c     Write reports.
c
      CALL MSRT
c
c     Close technical and financial calculations results file.
c
      CLOSE(UNIT=LUCALC)
c
c     Return to command level menu.
c
      IF (COMAND.EQ.RN) GOTO 10
c
   60 IF (OPENED.EQ.YES) CLOSE(UNIT=LURT)
c
      CALL EXIT
c
      END
```

APPENDIX 5 cont'd

```
      3.  INITIALISE SYSTEM AND USER VARIABLES
C
      VDU    =0     !  Video [TELETYPE] identity.
      COLSTT=80     !  Video [TELETYPE] columns.
      ROWSTT=24     !  Video [TELETYPE] rows.
      COLSDK=132    !  Printer [DISK] columns.
      ROWSDK=66     !  Printer [DISK] rows.
C
      COL    =1     !  Video [TELETYPE] column co-ordinate.
      ROW    =1     !  Video [TELETYPE] row co-ordinate.
C
      LUTT   =1     !  Logical unit video [TELETYPE] I/O.
      LUDK   =2     !  Logical unit printer [DISK] output.
      LUDA   =3     !  Logical unit data I/O.
      LUCALC=4      !  Logical unit technical and financial calculations.
      LURT   =LUTT  !  Logical unit reports output.
C
      MAXSU =1      !  Maximum number of system and user data records.
      MAXRT =1      !  Maximum number of report data records.
      MAXA01=20     !  Maximum number of 2-wheel drive (tractor) data records.
      MAXA02=20     !  Maximum number of unequal 4-wheel drive data records.
      MAXA03=20     !  Maximum number of equal 4-wheel drive data records.
      MAXC01=20     !  Maximum number of mould board (plough) data records.
      MAXC02=20     !  Maximum number of chisel (plough) data records.
      MAXC03=20     !  Maximum number of shallow (plough) data records.
      MAXC04=20     !  Maximum number of rotary (plough) data records.
      MAXC05=20     !  Maximum number of rotary tine (plough) data records.
      MAXF01=20     !  Maximum number of direct drill data records.
      MAXF02=20     !  Maxmimum number of disc drill data records.
      MAXI00=20     !  Maxmimum number of cultivator data records.
      MAXSS =20     !  Maximum number of soil specification data records.
      MAXOC =20     !  Maximum number of operating conditions data records.
      MAXAC =20     !  Maximum number of additional costs data records.
      MAXCS =20     !  Maximum number of combination selection data
C                   !  records.
      MAXRSR=20     !  Maximum number of results records.
C
      SURL   =256   !  System and user record length.
      RTRL   =256   !  Report record length.
      A01RL  =128   !  2-wheel drive (tractor) record length.
      A02RL  =128   !  Unequal 4-wheel drive (tractor) record length.
      A03RL  =128   !  Equal 4-wheel drive (tractor) record length.
      C01RL  =128   !  Mould board (plough) record length.
      C02RL  =128   !  Chisel (plough) record length.
      C03RL  =128   !  Shallow (plough) record length.
      C04RL  =128   !  Rotary (plough) record length.
      C05RL  =128   !  Rotary tine (plough) record length.
      F01RL  =128   !  Direct drill record length.
      F02RL  =128   !  Disc drill record length.
      I00RL  =128   !  Cultivator record length.
      SSRL   =256   !  Soil specification record length.
      OCRL   =256   !  Operating conditions record length.
      ACRL   =256   !  Additional costs record length.
      CSRL   =256   !  Combination selection record length.
C
      CALL ASSIGN(1,'TT:',3)
```

APPENDIX 5 cont'd

```
C
      OUTDEV=TT     !  Default output device.
      OPENED=NO     !  Default status of reports listing file MSP.LST.
      RUNNO =0      !  Program run number.
C
      OPEN(UNIT=LUDA,NAME='MSSU.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=SURL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXSU)
C
      SUREC = 1
      READ(LUDA'SUREC) PROG,USER,TITLE
C
      CLOSE(UNIT=LUDA)
C
C     Initialise data summary and Reports variables.
C
      DATASY = NO
      RPORTS = 12
C
      DO 10 I=1,RPORTS
        REPORT(I)=NO
   10 CONTINUE
C
      RETURN
C
      END
```

APPENDIX 5 cont'd

```
     4.  INITIALISE VARIABLES
     ________________________
C
      CHOICE( 1) = '1   '
      CHOICE( 2) = '2   '
      CHOICE( 3) = '3   '
      CHOICE( 4) = '4   '
      CHOICE( 5) = '5   '
      CHOICE( 6) = '6   '
      CHOICE( 7) = '7   '
      CHOICE( 8) = '8   '
      CHOICE( 9) = '9   '
      CHOICE(10) = '10  '
      CHOICE(11) = '11  '
      CHOICE(12) = '12  '
      CHOICE(13) = '13  '
      CHOICE(14) = '14  '
      CHOICE(15) = '15  '
C
C     Initialise array containing valid commands.
C
      RARRAY( 1)=QUERY
      RARRAY( 2)=SU
      RARRAY( 3)=RT
C
      DO 10 I=1,15
         RARRAY(I+3) = CHOICE(I)
   10 CONTINUE
C
      RARRAY(19)=SS
      RARRAY(20)=OC
      RARRAY(21)=AC
      RARRAY(22)=CS
      RARRAY(23)=TT
      RARRAY(24)=DK
      RARRAY(25)=RN
      RARRAY(26)=EX
C
   20 CONTINUE
C
C     Write command prompt.
C
      CALL LINE(LUTT)
      WRITE(LUTT,30)
C
C     Read command.
C
      CALL READA(LUTT,LUTT,COMAND,RARRAY,26,ERROR)
      IF (ERROR.NE.0) GOTO 20
C
C     Assign output device.
C
      IF (COMAND.EQ.TT) OUTDEV=TT
      IF (COMAND.EQ.DK) OUTDEV=DK
C
C     Spool file attached to logical unit LURT.
C
```

```
      IF (OPENED.EQ.YES.AND.OUTDEV.EQ.TT) CLOSE(UNIT=LURT)
      IF (OPENED.EQ.YES.AND.OUTDEV.EQ.TT) OPENED=NO
c
c     Assign report logical unit.
c
      IF (OUTDEV.EQ.TT) LURT=LUTT
      IF (OUTDEV.EQ.DK) LURT=LUDK
c
c     Assign output device columns width.
c
      IF (OUTDEV.EQ.TT) COLSRT=COLSTT
      IF (OUTDEV.EQ.DK) COLSRT=COLSDK
c
      IF (COMAND.NE.QUERY) GOTO 400
c
c     If COMAND is QUERY list complete menu.
c
      WRITE(LUTT,40)
      WRITE(LUTT,50)
      WRITE(LUTT,60)
      WRITE(LUTT,70)
      WRITE(LUTT,80)
      WRITE(LUTT,100)
      WRITE(LUTT,130)
      WRITE(LUTT,140)
      WRITE(LUTT,160)
      WRITE(LUTT,230)
      WRITE(LUTT,240)
      WRITE(LUTT,250)
      WRITE(LUTT,260)
      IF (OUTDEV.EQ.TT) WRITE(LUTT,300)
      IF (OUTDEV.NE.TT) WRITE(LUTT,310)
      IF (OUTDEV.EQ.DK) WRITE(LUTT,320)
      IF (OUTDEV.NE.DK) WRITE(LUTT,330)
      WRITE(LUTT,340)
      WRITE(LUTT,350)
c
   30 FORMAT(1H , 4X,'MSP COMMAND: ',$)
   40 FORMAT(1H0,10X,'COMMAND',24X,'DESCRIPTION')
   50 FORMAT(1H ,10X,7('-'),4X,59('-'))
   60 FORMAT(1H ,12X,'SU',7X,'enter SYSTEM and USER data system')
   70 FORMAT(1H ,12X,'RT',7X,'enter REPORT data system')
   80 FORMAT(1H ,12X,' 1',7X,'enter TRACTOR data system')
  100 FORMAT(1H ,12X,' 3',7X,'enter PLOUGH data system')
  130 FORMAT(1H ,12X,' 6',7X,'enter MOUNTED DRILL data system')
  140 FORMAT(1H ,12X,' 7',7X,'enter TRALIED DRILL data system')
  160 FORMAT(1H ,12X,' 9',7X,'enter CULTIVATOR data system')
  230 FORMAT(1H ,12X,'SS',7X,'enter SOIL SPECIFICATION data system')
  240 FORMAT(1H ,12X,'OC',7X,'enter OPERATING CONDITIONS data system')
  250 FORMAT(1H ,12X,'AC',7X,'enter ADDITIONAL COSTS data system')
  260 FORMAT(1H ,12X,'CS',7X,'enter COMBINATION SELECTION data system')
  300 FORMAT(1H0,10X,'@ TT',7X,'enter video [TELETYPE] output mode')
  310 FORMAT(1H0,12X,'TT',7X,'enter video [TELETYPE] output mode')
  320 FORMAT(1H ,10X,'@ DK',7X,'enter printer [DISK] output mode')
  330 FORMAT(1H ,12X,'DK',7X,'enter printer [DISK] output mode')
  340 FORMAT(1H0,12X,'RN',7X,'RUN the program')
  350 FORMAT(1H ,12X,'EX',7X,'EXIT the program')
c
c     Get another command.
c
      GOTO 20
c
```

APPENDIX 5 cont'd

```
      5.  CALLING FILES
      _________________
C
      IF (COMAND.EQ.SU) CALL MSDSU
C
C     Report.
C
      IF (COMAND.EQ.RT) CALL MSDRT
C
C     Tractor.
C
      IF (COMAND.EQ.CHOICE(1)) CALL MSDA00
C
C     Plough.
C
      IF (COMAND.EQ.CHOICE(3)) CALL MSDC00
C
C     Mounted drill.
C
      IF (COMAND.EQ.CHOICE(6)) CALL MSDF00
C
C     Trailed drill.
C
      IF (COMAND.EQ.CHOICE(7)) CALL MSDG00
C
C     Cultivator/L-shape/tine.
C
      IF (COMAND.EQ.CHOICE(9)) CALL MSDI00
C
C     Soil specification.
C
      IF (COMAND.EQ.SS) CALL MSDSS
C
C     Operating conditions.
C
      IF (COMAND.EQ.OC) CALL MSDOC
C
C     Additional costs.
C
      IF (COMAND.EQ.AC) CALL MSDAC
      IF (COMAND.EQ.CS) CALL MSDCS
C
      RETURN
C
      END
```

APPENDIX 5 cont'd

```
      6.  SYSTEM AND USER
      _____________________
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSSU.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=SURL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXSU)
c
c     Read data from file.
c
      SUREC = 1
      READ(LUDA'SUREC) PROG,USER,TITLE
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  SYSTEM and USER         ')
   20 FORMAT(1H ,'  ------------------------')
c
c     Program name and version number.
c     Units: none.
c
      PROG(1)='MSP '
      PROG(2)='V1.3'
      PROG(3)='    '
c
c     User name.
c     Units: none.
c
      CALL LINE(LUTT)
      WRITE(LUTT,30)
   30 FORMAT(1H ,'  user        (1-20 chars)',$)
      CALL PGT(LUTT,LUTT,2,USER,5,2)
c
c     Title.
c     Units: none.
c
      CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  title       (1-20 chars)',$)
      CALL PGT(LUTT,LUTT,2,TITLE,5,2)
c
c     Write data to file.
c
      WRITE(LUDA'SUREC) PROG,USER,TITLE
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7. INPUT DATA SUBROUTINES

7.1 TRACTORS

```
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  TRACTOR                        ')
   20 FORMAT(1H ,' ------------------------')
c
c     Tractor type.
c     Units: none.
c
   30 WRITE(LUTT,40)
      WRITE(LUTT,50)
      WRITE(LUTT,60)
      WRITE(LUTT,70)
   40 FORMAT(1H0,'  type:                          ')
   50 FORMAT(1H ,'     2-wheel drive     (2WD)')
   60 FORMAT(1H ,'     Unequal 4-WD      (UNE4)')
   70 FORMAT(1H ,'     Equal 4-WD        (EQ4W)',$)
      RARRAY(1) = TWOWD
      RARRAY(2) = UNE4
      RARRAY(3) = EQ4W
      CALL PGA(LUTT,LUTT,5,TYPE,4,11,RARRAY,3,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     2-wheel drive.
      IF (TYPE.EQ.TWOWD) CALL MSDA01
c
c     Unequal 4-wheel drive.
      IF (TYPE.EQ.UNE4) CALL MSDA02
c
c     Equal 4-wheel drive.
      IF (TYPE.EQ.EQ4W) CALL MSDA03
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7.1.1 2-WD DRIVE TRACTOR

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSA01.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=A01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXA01)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  2-WHEEL DRIVE           ')
   20 FORMAT(1H ,'  ------------------------')
c
c     Record number.
c     Units: none.
c
c     Prevent record number 0 being selected.
      IF (A01REC.EQ.0) A01REC= 1
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  tractor number          ',$)
      CALL PGI(LUTT,LUTT,5,A01REC,4,11,1,MAXA01,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Read data from file.
c
      READ(LUDA'A01REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                  FLDD,WBAS
c
c     Model/manufacturer.
c     Units: none
c
   50 CALL LINE(LUTT)
      WRITE(LUTT,60)
   60 FORMAT(1H ,'  manufacturer/model      ',$)
      CALL PGT(LUTT,LUTT,2,TNAME,4,2)
c
c     Rear load on rear wheels.
c     Units: kg.
c
   70 CALL LINE(LUTT)
      WRITE(LUTT,80)
   80 FORMAT(1H ,'  load on rear wheels (kg)',$)
      CALL PGR(LUTT,LUTT,2,RWLD,10.2,8,100.00,10000.00,ERROR)
      IF (ERROR.NE.0) GOTO 70
c
c     Rear tyre width.
c     Units: inches.
c
   90 WRITE(LUTT,100)
  100 FORMAT(1H ,'  rear wheel width    (in)',$)
      CALL PGR(LUTT,LUTT,2,TRW,10.2,8,5.20,50.40,ERROR)
      IF (ERROR.NE.0) GOTO 90
c
c     Rear dim diameter.
c     Units: inches.
```

APPENDIX 5 cont'd

```
c
  110 WRITE(LUTT,120)
  120 FORMAT(1H ,'  rear rim diameter   (in)',$)
      CALL PGR(LUTT,LUTT,2,RMD,10.2,8,10.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 110
c
c     Rear tyre inflation pressure.
c     Units: kPa.
c
  130 WRITE(LUTT,140)
  140 FORMAT(1H ,'  rear tyre pressure (kPa)',$)
      CALL PGR(LUTT,LUTT,2,TINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 130
c
c     Front tyre section width.
c     Units: inches.
c
  150 CALL LINE(LUTT)
      WRITE(LUTT,160)
  160 FORMAT(1H ,'  front tyre width    (in)',$)
      CALL PGR(LUTT,LUTT,2,FTW,10.2,8,2.00,50.40,ERROR)
      IF (ERROR.NE.0) GOTO 150
c
c     Front rim dimeter.
c     Units: inches.
c
  170 WRITE(LUTT,180)
  180 FORMAT(1H ,'  front rim diameter  (in)',$)
      CALL PGR(LUTT,LUTT,2,FRD,10.2,8,5.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 170
c
c     Front tyre inflation pressure.
c     Units: kPa.
c
  190 WRITE(LUTT,200)
  200 FORMAT(1H ,'  front tyre pressure(kPa)',$)
      CALL PGR(LUTT,LUTT,2,FINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 190
c
c     Front tyre static load distribution.
c     Units: %.
  210 WRITE(LUTT,220)
  220 FORMAT(1H ,'  front static load     (%)',$)
      CALL PGR(LUTT,LUTT,2,FLDD,10.2,8,10.00,90.00,ERROR)
      IF (ERROR.NE.0) GOTO 210
c
c     Wheelbase
c     Units: m.
c
  230 WRITE(LUTT,240)
  240 FORMAT(1H ,'  wheelbase             (m)',$)
      CALL PGR(LUTT,LUTT,2,WBAS,10.2,8,1.50,3.50,ERROR)
      IF (ERROR.NE.0) GOTO 230
c
c     Write data to file.
c
      WRITE(LUDA'A01REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                   FLDD,WBAS
c
c     Close data file.
      CLOSE(UNIT=LUDA)
c
```

APPENDIX 5 cont'd

7.1.2 UNEQUAL 4-WD DRIVE TRACTOR

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSA02.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=A02RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXA02)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  Unequal 4-wheel drive    ')
   20 FORMAT(1H ,'  ------------------------')
c
c     Record number.
c     Units: none.
c
c     Prevent record number 0 being selected.
      IF (A02REC.EQ.0) A02REC= 1
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  tractor number           ',$)
      CALL PGI(LUTT,LUTT,5,A02REC,4,11,1,MAXA02,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Read data from file.
c
      READ(LUDA'A02REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                  FLDD,WBAS
c
c     Model/manufacturer.
c     Units: none
c
   50 CALL LINE(LUTT)
      WRITE(LUTT,60)
   60 FORMAT(1H ,'  manufacturer/model       ',$)
      CALL PGT(LUTT,LUTT,2,TNAME,4,2)
c
c     Rear load on rear wheels.
c     Units: kg.
c
   70 CALL LINE(LUTT)
      WRITE(LUTT,80)
   80 FORMAT(1H ,'  load on rear wheels (kg)',$)
      CALL PGR(LUTT,LUTT,2,RWLD,10.2,8,100.00,10000.00,ERROR)
      IF (ERROR.NE.0) GOTO 70
c
c     Rear tyre width.
c     Units: inches.
c
   90 WRITE(LUTT,100)
  100 FORMAT(1H ,'  rear wheel width    (in)',$)
      CALL PGR(LUTT,LUTT,2,TRW,10.2,8,5.20,50.40,ERROR)
      IF (ERROR.NE.0) GOTO 90
c
c     Rear dim diameter.
c     Units: inches.
```

APPENDIX 5 cont'd

```
c
  110 WRITE(LUTT,120)
  120 FORMAT(1H ,'  rear rim diameter   (in)',$)
      CALL PGR(LUTT,LUTT,2,RMD,10.2,8,10.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 110
c
c     Rear tyre inflation pressure.
c     Units: kPa.
c
  130 WRITE(LUTT,140)
  140 FORMAT(1H ,'  rear tyre pressure (kPa)',$)
      CALL PGR(LUTT,LUTT,2,TINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 130
c
c     Front tyre section width.
c     Units: inches.
c
  150 CALL LINE(LUTT)
      WRITE(LUTT,160)
  160 FORMAT(1H ,'  front tyre width    (in)',$)
      CALL PGR(LUTT,LUTT,2,FTW,10.2,8,2.00,50.40,ERROR)
      IF (ERROR.NE.0) GOTO 150
c
c     Front rim dimeter.
c     Units: inches.
c
  170 WRITE(LUTT,180)
  180 FORMAT(1H ,'  front rim diameter  (in)',$)
      CALL PGR(LUTT,LUTT,2,FRD,10.2,8,5.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 170
c
c     Front tyre inflation pressure.
c     Units: kPa.
c
  190 WRITE(LUTT,200)
  200 FORMAT(1H ,'  front tyre pressure(kPa)',$)
      CALL PGR(LUTT,LUTT,2,FINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 190
c
c     Front tyre static load distribution.
c     Units: %.
  210 WRITE(LUTT,220)
  220 FORMAT(1H ,'  front static load    (%)',$)
      CALL PGR(LUTT,LUTT,2,FLDD,10.2,8,10.00,90.00,ERROR)
      IF (ERROR.NE.0) GOTO 210
c
c     Wheelbase
c     Units: m.
c
  230 WRITE(LUTT,240)
  240 FORMAT(1H ,'  wheelbase              (m)',$)
      CALL PGR(LUTT,LUTT,2,WBAS,10.2,8,1.50,3.50,ERROR)
      IF (ERROR.NE.0) GOTO 230
c
c     Write data to file.
c
      WRITE(LUDA'A02REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                   FLDD,WBAS
c
c     Close data file.
```

APPENDIX 5 cont'd

```
    7.1.3  EQUAL 4-WD TRACTOR
c
c   Open data file.
c
    OPEN(UNIT=LUDA,NAME='MSA03.DAT',TYPE='OLD',DISPOSE='SAVE',
   &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
   &     RECORDSIZE=A03RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXA03)
c
    WRITE(LUTT,10)
    WRITE(LUTT,20)
 10 FORMAT(1H0,'  Equal 4-wheel drive     ')
 20 FORMAT(1H ,'  ------------------------')
c
c   Record number.
c   Units: none.
c
c   Prevent record number 0 being selected.
    IF (A03REC.EQ.0) A03REC= 1
 30 CALL LINE(LUTT)
    WRITE(LUTT,40)
 40 FORMAT(1H ,'  tractor number            ',$)
    CALL PGI(LUTT,LUTT,5,A03REC,4,11,1,MAXA03,ERROR)
    IF (ERROR.NE.0) GOTO 30
c
c   Read data from file.
c
    READ(LUDA'A03REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
   &                  FLDD,WBAS
c
c   Model/manufacturer.
c   Units: none
c
 50 CALL LINE(LUTT)
    WRITE(LUTT,60)
 60 FORMAT(1H ,'  manufacturer/model        ',$)
    CALL PGT(LUTT,LUTT,2,TNAME,4,2)
c
c   Rear load on rear wheels.
c   Units: kg.
c
 70 CALL LINE(LUTT)
    WRITE(LUTT,80)
 80 FORMAT(1H ,'  load on rear wheels (kg)',$)
    CALL PGR(LUTT,LUTT,2,RWLD,10.2,8,100.00,10000.00,ERROR)
    IF (ERROR.NE.0) GOTO 70
c
c   Rear tyre width.
c   Units: inches.
c
 90 WRITE(LUTT,100)
100 FORMAT(1H ,'  rear wheel width    (in)',$)
    CALL PGR(LUTT,LUTT,2,TRW,10.2,8,5.20,50.40,ERROR)
    IF (ERROR.NE.0) GOTO 90
c
c   Rear dim diameter.
c   Units: inches.
    CLOSE(UNIT=LUDA)
c
```

```
c
  110 WRITE(LUTT,120)
  120 FORMAT(1H ,'  rear rim diameter   (in)',$)
      CALL PGR(LUTT,LUTT,2,RMD,10.2,8,10.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 110
c
c     Rear tyre inflation pressure.
c     Units: kPa.
c
  130 WRITE(LUTT,140)
  140 FORMAT(1H ,'  rear tyre pressure (kPa)',$)
      CALL PGR(LUTT,LUTT,2,TINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 130
c
c     Front tyre section width.
c     Units: inches.
c
  150 CALL LINE(LUTT)
      WRITE(LUTT,160)
  160 FORMAT(1H ,'  front tyre width    (in)',$)
      CALL PGR(LUTT,LUTT,2,FTW,10.2,8,2.00,50.40,ERROR)
      IF (ERROR.NE.0) GOTO 150
c
c     Front rim dimeter.
c     Units: inches.
c
  170 WRITE(LUTT,180)
  180 FORMAT(1H ,'  front rim diameter  (in)',$)
      CALL PGR(LUTT,LUTT,2,FRD,10.2,8,5.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 170
c
c     Front tyre inflation pressure.
c     Units: kPa.
c
  190 WRITE(LUTT,200)
  200 FORMAT(1H ,'  front tyre pressure(kPa)',$)
      CALL PGR(LUTT,LUTT,2,FINFP,10.2,8,10.00,500.00,ERROR)
      IF (ERROR.NE.0) GOTO 190
c
c     Front tyre static load distribution.
c     Units: %.
  210 WRITE(LUTT,220)
  220 FORMAT(1H ,'  front static load     (%)',$)
      CALL PGR(LUTT,LUTT,2,FLDD,10.2,8,10.00,90.00,ERROR)
      IF (ERROR.NE.0) GOTO 210
c
c     Wheelbase
c     Units: m.
c
  230 WRITE(LUTT,240)
  240 FORMAT(1H ,'  wheelbase              (m)',$)
      CALL PGR(LUTT,LUTT,2,WBAS,10.2,8,1.50,3.50,ERROR)
      IF (ERROR.NE.0) GOTO 230
c
c     Write data to file.
c
      WRITE(LUDA'A03REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                   FLDD,WBAS
c
c     Close data file.
      CLOSE(UNIT=LUDA)
c
```

APPENDIX 5 cont'd

7.2 PLOUGHS

```
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  PLOUGH          ')
   20 FORMAT(1H ,'  ---------------------------')
c
   30 WRITE(LUTT,40)
      WRITE(LUTT,50)
      WRITE(LUTT,60)
      WRITE(LUTT,70)
      WRITE(LUTT,80)
      WRITE(LUTT,90)
   40 FORMAT(1H0,'  type:                        ')
   50 FORMAT(1H ,'    mould board          (MB)')
   60 FORMAT(1H ,'    chisel                (C)')
   70 FORMAT(1H ,'    shallow               (S)')
   80 FORMAT(1H ,'    rotary                (R)')
   90 FORMAT(1H ,'    rotary tine           (T)',$)
      RARRAY(1) = MB
      RARRAY(2) = C
      RARRAY(3) = S
      RARRAY(4) = R
      RARRAY(5) = T
      TYPE = MB
      CALL PGA(LUTT,LUTT,5,TYPE,4,11,RARRAY,2,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Mould board.
      IF (TYPE.EQ.MB) CALL MSDC01
c
c     Chisel.
      IF (TYPE.EQ.C) CALL MSDC02
c
c     Shallow.
      IF (TYPE.EQ.S) CALL MSDC03
c
c     Rotary.
      IF (TYPE.EQ.R) CALL MSDC04
c
c     Rotary tine.
c     IF (TYPE.EQ.T) CALL MSDC05
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7.2.1 MOULDBOARD PLOUGH

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSC01.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=C01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXC01)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  MOULD BOARD                ')
   20 FORMAT(1H ,'  ------------------------')
c
c     Prevent record number 0 being selected.
      IF (C01REC.EQ.0) C01REC= 1
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  plough number           ',$)
      CALL PGI(LUTT,LUTT,5,C01REC,4,11,1,MAXC01,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Read data from file.
c
      READ(LUDA'C01REC) MINPBS,MAXPBS,PANGLE,IAAP,IPAGE,IAAS
c
  180 CALL LINE(LUTT)
      WRITE(LUTT,190)
  190 FORMAT(1H ,'  min plough bodies       ',$)
      CALL PGI(LUTT,LUTT,5,MINPBS,4,11,1,10,ERROR)
      IF (ERROR.NE.0) GOTO 180
c
  195 WRITE(LUTT,198)
  198 FORMAT(1H ,'  max plough bodies       ',$)
      CALL PGI(LUTT,LUTT,5,MAXPBS,4,11,1,10,ERROR)
      IF (ERROR.NE.0) GOTO 195
c
  200 CALL LINE(LUTT)
      WRITE(LUTT,210)
  210 FORMAT(1H ,'  plough tail angle  (rad)',$)
      CALL PGR(LUTT,LUTT,2,PANGLE,10.2,8,0.50,0.95,ERROR)
      IF (ERROR.NE.0) GOTO 200
c
  240 CALL LINE(LUTT)
      WRITE(LUTT,250)
  250 FORMAT(1H ,'  imp. purchase age.  (yr)',$)
      CALL PGI(LUTT,LUTT,5,IAAP,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 240
c
  260 WRITE(LUTT,270)
  270 FORMAT(1H ,'  imp. present age    (yr)',$)
      CALL PGI(LUTT,LUTT,5,IPAGE,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 260
c
  280 WRITE(LUTT,290)
  290 FORMAT(1H ,'  imp. sale age       (yr)',$)
      CALL PGI(LUTT,LUTT,5,IAAS,4,11,0,12,ERROR)
      IF (ERROR.NE.0) GOTO 280
```

```
c
c
c     Write data to file.
c
      WRITE(LUDA'C01REC) MINPBS,MAXPBS,PANGLE,IAAP,IPAGE,IAAS
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

7.2.2 CHISEL PLOUGH

```
c     ____________________
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  CHISEL                  ')
   20 FORMAT(1H ,'  ------------------------')
c
      WRITE(LUTT,30)
   30 FORMAT(1H0,'  This facility is not implemented.')
c
      RETURN
c
      END
```

7.2.3 SHALLOW PLOUGH

```
c     ____________________
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  SHALLOW                 ')
   20 FORMAT(1H ,'  ------------------------')
c
      WRITE(LUTT,30)
   30 FORMAT(1H0,'  This facility is not implemented.')
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7.3 CULTIVATORS

```
 C
 C   Open data file.
 C
     OPEN(UNIT=LUDA,NAME='MSI00.DAT',TYPE='OLD',DISPOSE='SAVE',
    &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
    &     RECORDSIZE=F01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXI00)
 C
     WRITE(LUTT,10)
     WRITE(LUTT,20)
  10 FORMAT(1H0,'  CULTIVATOR                    ')
  20 FORMAT(1H ,' ------------------------------')
 C
 C   Prevent record number 0 being selected.
     IF (I00REC.EQ.0) I00REC= 1
  30 CALL LINE(LUTT)
     WRITE(LUTT,40)
  40 FORMAT(1H ,' cultivator number          ',$)
     CALL PGI(LUTT,LUTT,5,I00REC,4,11,1,MAXI00,ERROR)
     IF (ERROR.NE.0) GOTO 30
 C
 C   Read data from file.
 C
     READ(LUDA'I00REC) CNF,MINCFW,MAXCFW,INCCFW,
    &                  CDEPTH,MINCSP,MAXCSP,INCCSP,CAAP,CPAGE,CAAS
 C
  50 CALL LINE(LUTT)
     WRITE(LUTT,60)
  60 FORMAT(1H ,'  no. blades/tines (NBT/m)',$)
     CALL PGI(LUTT,LUTT,5,CNF,4,11,5,200,ERROR)
     IF (ERROR.NE.0) GOTO 50
 C
 210 CALL LINE(LUTT)
     WRITE(LUTT,220)
 220 FORMAT(1H ,'  min cultivator width (m)',$)
     CALL PGR(LUTT,LUTT,2,MINCFW,11.3,7,0.500,10.500,ERROR)
     IF (ERROR.NE.0) GOTO 210
 C
 230 WRITE(LUTT,240)
 240 FORMAT(1H ,'  max cultivator width (m)',$)
     CALL PGR(LUTT,LUTT,2,MAXCFW,11.3,7,0.50,10.500,ERROR)
     IF (ERROR.NE.0) GOTO 230
 C
 250 WRITE(LUTT,260)
 260 FORMAT(1H ,'  inc cultivator wdith (m)',$)
     CALL PGR(LUTT,LUTT,2,INCCFW,11.3,7,0.050,10.50,ERROR)
     IF (ERROR.NE.0) GOTO 250
 C
 208 CALL LINE(LUTT)
     WRITE(LUTT,209)
 209 FORMAT(1H ,'  cultivation depth    (m)',$)
     CALL PGR(LUTT,LUTT,2,CDEPTH,10.2,8,0.05,0.30,ERROR)
     IF (ERROR.NE.0) GOTO 208
 C
 211 CALL LINE(LUTT)
     WRITE(LUTT,212)
```

```
  212 FORMAT(1H ,'  min cult. speed   (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MINCSP,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 211
c
  213 WRITE(LUTT,214)
  214 FORMAT(1H ,'  max cult. speed   (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MAXCSP,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 213
c
  216 WRITE(LUTT,217)
  217 FORMAT(1H ,'  inc cult. speed   (km/h)',$)
      CALL PGR(LUTT,LUTT,2,INCCSP,10.2,8,0.50,20.0,ERROR)
      IF (ERROR.NE.0) GOTO 216
c
  280 CALL LINE(LUTT)
      WRITE(LUTT,290)
  290 FORMAT(1H ,'  cult. purchase age. (yr)',$)
      CALL PGI(LUTT,LUTT,5,CAAP,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 280
c
  300 WRITE(LUTT,310)
  310 FORMAT(1H ,'  cult. present age   (yr)',$)
      CALL PGI(LUTT,LUTT,5,CPAGE,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 300
c
  330 WRITE(LUTT,340)
  340 FORMAT(1H ,'  cult. sale age      (yr)',$)
      CALL PGI(LUTT,LUTT,5,CAAS,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 330
c
c     Write data to file.
c
      WRITE(LUDA'IOOREC) CNF,MINCFW,MAXCFW,INCCFW,
     &                   CDEPTH,MINCSP,MAXCSP,INCCSP,CAAP,CPAGE,CAAS
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
```

7.3.1 ROTARY L-SHAPE CULTIVATOR

```
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  ROTARY                  ')
   20 FORMAT(1H ,'  ------------------------')
c
      RETURN
c
```

7.3.2 ROTARY TINE CULTIVATOR

```
c
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  ROTARY TINE             ')
   20 FORMAT(1H ,'  ------------------------')
c
      RETURN
c
```

APPENDIX 5 cont'd

7.4 DRILLS

```
c
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  DRILL        ')
   20 FORMAT(1H ,' ----------------------')
c
   30 WRITE(LUTT,40)
      WRITE(LUTT,50)
      WRITE(LUTT,60)
   40 FORMAT(1H0,'  type:              ')
   50 FORMAT(1H ,'mounted grain drill(MGDR)')
   60 FORMAT(1H ,'trailed grain drill(DSDR)',$)
      RARRAY(1) = MGDR
      RARRAY(2) = DSDR
      TYPE = MGDR
      CALL PGA(LUTT,LUTT,5,TYPE,4,11,RARRAY,2,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Mounted grain drill.
      IF (TYPE.EQ.MGDR)  CALL MSDF01
c
c     Disc drill.
      IF (TYPE.EQ.DSDR)  CALL MSDF02
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7.4.1 MOUNTED DRILL

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSF01.DAT',TYPE='OLD',DISPOSE='SAVE',
     &    ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &    RECORDSIZE=F01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXF01)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  MOUNTED DRILL              ')
   20 FORMAT(1H ,'  -------------------------')
c
c     Prevent record number 0 being selected.
      IF (F01REC.EQ.0) F01REC= 1
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  drill number              ',$)
      CALL PGI(LUTT,LUTT,5,F01REC,4,11,1,MAXF01,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Read data from file.
c
      READ(LUDA'F01REC) MINDNR,MAXDNR,INCDNR,MINDW,MAXDW,INCDW,DDEPTH,
     &                  MINDSP,MAXDSP,INCDSP,DAAP,DPAGE,DAAS
c
   50 CALL LINE(LUTT)
      WRITE(LUTT,60)
   60 FORMAT(1H ,'  min no. of coulters       ',$)
      CALL PGI(LUTT,LUTT,5,MINDNR,4,11,5,200,ERROR)
      IF (ERROR.NE.0) GOTO 50
c
   70 WRITE(LUTT,80)
   80 FORMAT(1H ,'  max no. of coulters       ',$)
      CALL PGI(LUTT,LUTT,5,MAXDNR,4,11,5,200,ERROR)
      IF (ERROR.NE.0) GOTO 70
c
  141 WRITE(LUTT,142)
  142 FORMAT(1H ,'  inc no. of coulters       ',$)
      CALL PGI(LUTT,LUTT,5,INCDNR,4,11,MAXDNR-MINDNR,MAXDNR,ERROR)
      IF (ERROR.NE.0) GOTO 141
c
  180 CALL LINE(LUTT)
      WRITE(LUTT,190)
  190 FORMAT(1H ,'  min coulter space     (m)',$)
      CALL PGR(LUTT,LUTT,2,MINDW,11.3,7,0.005,0.500,ERROR)
      IF (ERROR.NE.0) GOTO 180
c
  195 WRITE(LUTT,198)
  198 FORMAT(1H ,'  max coulter space     (m)',$)
      CALL PGR(LUTT,LUTT,2,MAXDW,11.3,7,0.005,0.500,ERROR)
      IF (ERROR.NE.0) GOTO 195
c
  200 WRITE(LUTT,210)
  210 FORMAT(1H ,'  inc coulter space     (m)',$)
      CALL PGR(LUTT,LUTT,2,INCDW,11.3,7,0.010,0.500,ERROR)
```

```
      IF (ERROR.NE.0) GOTO 200
c
  208 CALL LINE(LUTT)
      WRITE(LUTT,209)
  209 FORMAT(1H ,'  drilling depth       (m)',$)
      CALL PGR(LUTT,LUTT,2,DDEPTH,10.2,8,0.05,0.30,ERROR)
      IF (ERROR.NE.0) GOTO 208
c
  211 CALL LINE(LUTT)
      WRITE(LUTT,212)
  212 FORMAT(1H ,'  min drill speed   (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MINDSP,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 211
c
  213 WRITE(LUTT,214)
  214 FORMAT(1H ,'  max drill speed   (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MAXDSP,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 213
c
  216 WRITE(LUTT,217)
  217 FORMAT(1H ,'  inc drill speed   (km/m)',$)
      CALL PGR(LUTT,LUTT,2,INCDSP,10.2,8,0.50,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 216
c
  240 CALL LINE(LUTT)
      WRITE(LUTT,250)
  250 FORMAT(1H ,'  drill purchase age. (yr)',$)
      CALL PGI(LUTT,LUTT,5,DAAP,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 240
c
  260 WRITE(LUTT,270)
  270 FORMAT(1H ,'  drill present age   (yr)',$)
      CALL PGI(LUTT,LUTT,5,DPAGE,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 260
c
  280 WRITE(LUTT,290)
  290 FORMAT(1H ,'  drill sale age      (yr)',$)
      CALL PGI(LUTT,LUTT,5,DAAS,4,11,0,10,ERROR)
      IF (ERROR.NE.0) GOTO 280
c
c     Write data to file.
c
      WRITE(LUDA'F01REC) MINDNR,MAXDNR,INCDNR,MINDW,MAXDW,INCDW,DDEPTH,
     &                   MINDSP,MAXDSP,INCDSP,DAAP,DPAGE,DAAS
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

7.4.2 TRAILED DRILL

```
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  TRAILED DRIL                     ')
   20 FORMAT(1H ,'  ------------------------')
c
      RETURN
c
```

APPENDIX 5 cont'd

7.5 SOIL SPECIFICATIONS

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSSS.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=SSRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXSS)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'   SOIL SPECIFICATIONS     ')
   20 FORMAT(1H ,'   ------------------------')
c
c     Prevent record number 0 being selected.
      IF (SSREC.EQ.0) SSREC = 1
   25 CALL LINE(LUTT)
      WRITE(LUTT,28)
   28 FORMAT(1H ,'  soil number              ',$)
      CALL PGI(LUTT,LUTT,5,SSREC,4,11,1,MAXSS,ERROR)
      IF (ERROR.NE.0) GOTO 25
c
c     Read data from file.
c
      READ(LUDA'SSREC) SSNAME,PCLAY,PSILT,PSAND,PHUMUS,FC,
     &      MCWW,MCFC,SBD,DRSAT,DRFC,SLQWW,SLQFC,SPLWW,
     &      SPLFC,SWPWW,SWPFC,WABY,SKC,SKF,SCR
c
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'  name        (1-16 chars)',$)
      CALL PGT(LUTT,LUTT,2,SSNAME,4,2)
      ERROR = 1
      IF (SSNAME(1).EQ.'WINT'.OR.SSNAME(1).EQ.'DARV'.OR.
     & 'MACM') ERROR = 0
      IF (ERROR.EQ.1) WRITE(LUTT,50)
c
   50 FORMAT(1H0,' Valid soil series are Winton and Darvel and
     & Macmerry. ,/,
     &            Please correct your entry.',/)
      IF (ERROR.NE.0) GOTO 30
c
   60 CALL LINE(LUTT)
      WRITE(LUTT,70)
   70 FORMAT(1H ,'  clay                     (%)',$)
      CALL PGR(LUTT,LUTT,2,PCLAY,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 60
c
   80 WRITE(LUTT,90)
   90 FORMAT(1H ,'  silt                     (%)',$)
      CALL PGR(LUTT,LUTT,2,PSILT,10.2,8,0.00,50.00,ERROR)
      IF (ERROR.NE.0) GOTO 80
c
  100 WRITE(LUTT,110)
  110 FORMAT(1H ,'  sand                     (%)',$)
      CALL PGR(LUTT,LUTT,2,PSAND,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 100
```

APPENDIX 5 cont'd

```
c
  120 WRITE(LUTT,130)
  130 FORMAT(1H ,'  humus                    (%)',$)
      CALL PGR(LUTT,LUTT,2,PHUMUS,10.2,8,0.00,50.00,ERROR)
      IF (ERROR.NE.0) GOTO 120
c
      IF ((PCLAY + PSILT + PSAND + PHUMUS).GT.100.00) WRITE(LUTT,135)
  135 FORMAT(1H0,'  Warning: the sum of clay, silt, sand and humus ',
     &          'contents exceeds 100 %.',
     &     /,'    Please correct your entries.')
      IF ((PCLAY + PSILT + PSAND + PHUMUS).GT.100.00) GOTO 60
c
  140 CALL LINE(LUTT)
      WRITE(LUTT,150)
  150 FORMAT(1H ,'  field capacity        (mm)',$)
      CALL PGR(LUTT,LUTT,2,FC,10.2,8,90.00,130.00,ERROR)
      IF (ERROR.NE.0) GOTO 140
c
  160 CALL LINE(LUTT)
      WRITE(LUTT,170)
  170 FORMAT(1H ,'  moisture content  (%w/w)',$)
      CALL PGR(LUTT,LUTT,2,MCWW,10.2,8,5.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 160
c
  180 WRITE(LUTT,190)
      WRITE(LUTT,200)
  190 FORMAT(1H ,'  moisture content at       ')
  200 FORMAT(1H ,'  field capacity      (%w/w)',$)
      CALL PGR(LUTT,LUTT,2,MCFC,10.2,8,5.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 180
c
  210 WRITE(LUTT,220)
  220 FORMAT(1H ,'  bulk density        (g/cm3)',$)
      CALL PGR(LUTT,LUTT,2,SBD,10.2,8,1.10,2.60,ERROR)
      IF (ERROR.NE.0) GOTO 210
c
      WRITE(LUTT,230)
  230 FORMAT(1H0,'  drainage at:                ')
  240 WRITE(LUTT,250)
  250 FORMAT(1H ,'     saturation       (mm/d)',$)
      CALL PGR(LUTT,LUTT,2,DRSAT,10.2,8,0.50,150.00,ERROR)
      IF (ERROR.NE.0) GOTO 240
  260 WRITE(LUTT,270)
  270 FORMAT(1H ,'     field capacity  (mm/d)',$)
      CALL PGR(LUTT,LUTT,2,DRFC,10.2,8,0.50,150.00,ERROR)
      IF (ERROR.NE.0) GOTO 260
c
  280 CALL LINE(LUTT)
      WRITE(LUTT,290)
  290 FORMAT(1H ,'  liquid limit        (%w/w)',$)
      CALL PGR(LUTT,LUTT,2,SLQWW,10.2,8,10.00,150.00,ERROR)
      IF (ERROR.NE.0) GOTO 280
  300 WRITE(LUTT,310)
  310 FORMAT(1H ,'  liquid limit          (%fc)',$)
      CALL PGR(LUTT,LUTT,2,SLQFC,10.2,8,10.00,200.00,ERROR)
      IF (ERROR.NE.0) GOTO 300
c
  320 CALL LINE(LUTT)
      WRITE(LUTT,330)
  330 FORMAT(1H ,'  plastic limit       (%w/w)',$)
```

```
      CALL PGR(LUTT,LUTT,2,SPLWW,10.2,8,10.00,200.00,ERROR)
      IF (ERROR.NE.0) GOTO 320
  340 WRITE(LUTT,350)
  350 FORMAT(1H ,'  plastic limit      (%fc)',$)
      CALL PGR(LUTT,LUTT,2,SPLFC,10.2,8,10.00,200.00,ERROR)
      IF (ERROR.NE.0) GOTO 340
c
  360 CALL LINE(LUTT)
      WRITE(LUTT,370)
  370 FORMAT(1H ,'  wilting point      (%w/w)',$)
      CALL PGR(LUTT,LUTT,2,SWPWW,10.2,8,1.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 360
  380 WRITE(LUTT,390)
  390 FORMAT(1H ,'  wilting point      (%fc)',$)
      CALL PGR(LUTT,LUTT,2,SWPFC,10.2,8,1.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 380
c
  400 WRITE(LUTT,410)
  410 FORMAT(1H ,'  soil workability   (%fc)',$)
      CALL PGI(LUTT,LUTT,5,WABY,4,11,100,110,ERROR)
      IF (ERROR.NE.0) GOTO 400
c
c       IF (WABY.EQ. 90) GOTO 430
c       IF (WABY.EQ. 95) GOTO 430
      IF (WABY.EQ.100) GOTO 430
      IF (WABY.EQ.105) GOTO 430
      IF (WABY.EQ.110) GOTO 430
c       IF (WABY.EQ.115) GOTO 430
c       IF (WABY.EQ.120) GOTO 430
c       IF (WABY.EQ.125) GOTO 430
c       IF (WABY.EQ.130) GOTO 430
c
      WRITE(LUTT,420)
  420 FORMAT(1H0,'  Valid values for soil workability are ',/,
     &          '  100, 105, and 110.',/,
     &          '  Please correct your entry.',/)
      GOTO 400
  430 CONTINUE
c
  440 CALL LINE(LUTT)
      WRITE(LUTT,450)
  450 FORMAT(1H ,'  cohesive parameter       ',$)
      CALL PGR(LUTT,LUTT,2,SKC,13.5,5,0.00001,100.00000,ERROR)
      IF (ERROR.NE.0) GOTO 440
c
  470 WRITE(LUTT,480)
  480 FORMAT(1H ,'  frictional parameter     ',$)
      CALL PGR(LUTT,LUTT,2,SKF,13.5,5,0.00001,100.10000,ERROR)
      IF (ERROR.NE.0) GOTO 470
c
  490 WRITE(LUTT,500)
  500 FORMAT(1H ,'  soil clay ratio          ',$)
      CALL PGR( LUTT,LUTT,2,SCR,12.4,6,0.0010,100.0000,ERROR)
      IF (ERROR.NE.0) GOTO 490
c
c     Write data to file.
c
      WRITE(LUDA'SSREC) SSNAME,PCLAY,PSILT,PSAND,PHUMUS,FC,
     &                  MCWW,MCFC,SBD,DRSAT,DRFC,SLQWW,SLQFC,SPLWW,
     &                  SPLFC,SWPWW,SWPFC,WABY,SKC,SKF,SCR
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
```

APPENDIX 5 cont'd

7.6 OPERATING CONDITIONS

```
c
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSOC.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=OCRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXOC)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  OPERATING CONDITIONS    ')
   20 FORMAT(1H ,' ------------------------')
c
c     Prevent record number 0 being selected.
      IF (OCREC.EQ.0) OCREC = 1
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,' operating number          ',$)
      CALL PGI(LUTT,LUTT,5,OCREC,4,11,1,MAXOC,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
c     Read data from file.
c
      READ(LUDA'OCREC) SWNO,CWNO,FE,PROB,AREA,MINPS,MAXPS,INCPS,
     &                 MINPCD,MAXPCD,INCPCD,PLSDAY,PLCDAY,TTUSEH,
     &                 TAAP,TPAGE,TAAS
c
   50 CALL LINE(LUTT)
      WRITE(LUTT,60)
   60 FORMAT(1H ,'  start week number          ',$)
      CALL PGI(LUTT,LUTT,5,SWNO,4,11,1,52,ERROR)
      IF (ERROR.NE.0) GOTO 50
c
   70 WRITE(LUTT,80)
   80 FORMAT(1H ,'  finish week number         ',$)
      CALL PGI(LUTT,LUTT,5,CWNO,4,11,SWNO,52,ERROR)
      IF (ERROR.NE.0) GOTO 70
c
   90 CALL LINE(LUTT)
      WRITE(LUTT,100)
  100 FORMAT(1H ,' field efficiency     (%)',$)
      CALL PGI(LUTT,LUTT,5,FE,4,11,60,100,ERROR)
      IF (ERROR.NE.0) GOTO 90
c
  110 CALL LINE(LUTT)
      WRITE(LUTT,120)
  120 FORMAT(1H ,' probability level    (%)',$)
      CALL PGI(LUTT,LUTT,5,PROB,4,11,80,100,ERROR)
      IF (ERROR.NE.0) GOTO 110
c
c      IF (PROB.EQ. 70) GOTO 130
      IF (PROB.EQ. 80) GOTO 130
      IF (PROB.EQ. 90) GOTO 130
      IF (PROB.EQ.100) GOTO 130
c
      WRITE(LUTT,170)
```

APPENDIX 5 cont'd

```
  170 FORMAT(1H0,'  Valid values for probability level are ',/,
     &         '  80, 90 and 100.',/,
     &         '  Please correct your entry.',/)
      GOTO 110
  130 CONTINUE
c
  180 CALL LINE(LUTT)
      WRITE(LUTT,190)
  190 FORMAT(1H ,'  area                    (ha)',$)
      CALL PGR(LUTT,LUTT,2,AREA,10.2,8,100.00,1000.00,ERROR)
      IF (ERROR.NE.0) GOTO 180
c
  200 CALL LINE(LUTT)
      WRITE(LURT,210)
  210 FORMAT(1H ,'  min plough speed  (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MINPS,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 200
c
  220 WRITE(LUTT,230)
  230 FORMAT(1H ,'  max plough speed  (km/h)',$)
      CALL PGR(LUTT,LUTT,2,MAXPS,10.2,8,1.00,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 220
c
  240 WRITE(LUTT,250)
  250 FORMAT(1H ,' inc plough speed  (km/h)',$)
      CALL PGR(LUTT,LUTT,2,INCPS,10.2,8,0.50,20.00,ERROR)
      IF (ERROR.NE.0) GOTO 240
c
  260 CALL LINE(LUTT)
      WRITE(LUTT,270)
  270 FORMAT(1H ,'  min plough cut depth (m)',$)
      CALL PGR(LUTT,LUTT,2,MINPCD,10.2,8,0.05,0.40,ERROR)
      IF (ERROR.NE.0) GOTO 260
c
  280 WRITE(LUTT,290)
  290 FORMAT(1H ,'  max plough cut depth (m)',$)
      CALL PGR(LUTT,LUTT,2,MAXPCD,10.2,8,0.05,0.40,ERROR)
      IF (ERROR.NE.0) GOTO 280
c
  300 WRITE(LUTT,310)
  310 FORMAT(1H ,'  inc plough cut depth (m)',$)
      CALL PGR(LUTT,LUTT,2,INCPCD,10.2,8,0.05,0.40,ERROR)
      IF (ERROR.NE.0) GOTO 300
c
  340 CALL LINE(LUTT)
      WRITE(LUTT,350)
  350 FORMAT(1H ,'  plough start day        ',$)
      CALL PGI(LUTT,LUTT,5,PLSDAY,4,11,1,500,ERROR)
      IF (ERROR.NE.0) GOTO 340
c
  360 WRITE(LUTT,370)
  370 FORMAT(1H ,'  plough finish day       ',$)
      CALL PGI(LUTT,LUTT,5,PLCDAY,4,11,PLSDAY,500,ERROR)
      IF (ERROR.NE.0) GOTO 360
c
c     Tractor annual use.
c     Units: hours.
c
  380 CALL LINE(LUTT)
      WRITE(LUTT,390)
```

APPENDIX 5 cont'd

```
  390 FORMAT(1H ,'  tractor annual use (h/y)',$)
      CALL PGR(LUTT,LUTT,2,TTUSEH,10.2,8,0.00,12000.00,ERROR)
      IF (ERROR.NE.0) GOTO 380
c
c     Tractor purchase age.
c     Units: years.
c
c
  400 WRITE(LUTT,410)
  410 FORMAT(1H ,'  tractor purchase age (y)',$)
      CALL PGI(LUTT,LUTT,5,TAAP,4,11,0,12,ERROR)
      IF (ERROR.NE.0) GOTO 400
c
c     Tractor present age.
c     Units: years.
c
  420 WRITE(LUTT,430)
  430 FORMAT(1H ,'  tractor present age  (y)',$)
      CALL PGI(LUTT,LUTT,5,TPAGE,4,11,TAAP,12,ERROR)
      IF (ERROR.NE.0) GOTO 420
c
c     Tractor sale age.
c     Units: years.
c
  440 WRITE(LUTT,450)
  450 FORMAT(1H ,'  tractor sale age      (y)',$)
      CALL PGI(LUTT,LUTT,5,TAAS,4,11,0,12,ERROR)
c
c     Write data to file.
c
      WRITE(LUDA'OCREC) SWNO,CWNO,FE,PROB,AREA,MINPS,MAXPS,INCPS,
     &                  MINPCD,MAXPCD,INCPCD,PLSDAY,PLCDAY,TTUSEH,
     &                  TAAP,TPAGE,TAAS
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

```
      7.7 OPERATIONAL COSTS
      _____________________
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSAC.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=ACRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXAC)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  OPERATIONAL COSTS       ')
   20 FORMAT(1H ,' -----------------------')
c
c     Prevent record number 0 being selected.
      IF (ACREC.EQ.0) ACREC  = 1
   25 CALL LINE(LUTT)
      WRITE(LUTT,28)
   28 FORMAT(1H ,'  additional number      ',$)
      CALL PGI(LUTT,LUTT,5,ACREC,4,11,1,MAXAC,ERROR)
      IF (ERROR.NE.0) GOTO 25
c
c     Read data from file.
c
      READ(LUDA'ACREC) INTR,INFR,INVR,TAXR,FCOSTL,LCOSTH,TSHCY,IMSHCY,
     &                 TTAXCY,CROPNE,CROPVT
c
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,' loan interest rate      ',$)
      CALL PGR(LUTT,LUTT,2,INTR,10.2,8,0.00,50.00,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
   50 WRITE(LUTT,60)
   60 FORMAT(1H ,'inflation rate           ',$)
      CALL PGR(LUTT,LUTT,2,INFR,10.2,8,0.00,50.00,ERROR)
      IF (ERROR.NE.0) GOTO 50
c
  500 WRITE(LUTT,511)
  511 FORMAT(1H ,' investement rate        ',$)
      CALL PGR(LUTT,LUTT,2,INVR,10.2,8,0.00,50.00,ERROR)
      IF (ERROR.NE.0) GOTO 500
c
 1011 WRITE(LUTT,1012)
 1012 FORMAT(1H ,'   tax rate              ',$)
      CALL PGR(LUTT,LUTT,2,TAXR,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 1011
c
   70 WRITE(LUTT,80)
   80 FORMAT(1H ,'  fuel cost           (/l)',$)
      CALL PGR(LUTT,LUTT,2,FCOSTL,10.2,8,0.00,0.30,ERROR)
      IF (ERROR.NE.0) GOTO 70
c
   90 WRITE(LUTT,100)
  100 FORMAT(1H ,'  labour cost      (/hour)',$)
      CALL PGR(LUTT,LUTT,2,LCOSTH,10.2,8,0.00,10.00,ERROR)
      IF (ERROR.NE.0) GOTO 90
c
```

```
  110 WRITE(LUTT,120)
  120 FORMAT(1H ,'  Tr shelter cost  (/year)',$)
      CALL PGR(LUTT,LUTT,2,TSHCY,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 110
c
  130 WRITE(LUTT,140)
  140 FORMAT(1H ,'  Im shelter cost  (/year)',$)
      CALL PGR(LUTT,LUTT,2,IMSHCY,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 130
c
  150 WRITE(LUTT,170)
  170 FORMAT(1H ,'  tractor tax      (/year)',$)
      CALL PGR(LUTT,LUTT,2,TTAXCY,10.2,8,0.00,100.00,ERROR)
      IF (ERROR.NE.0) GOTO 150
c
  200 CALL LINE(LUTT)
      WRITE(LUTT,210)
  210 FORMAT(1H ,'  crop          (1-16 chars)',$)
      CALL PGT(LUTT,LUTT,2,CROPNE,4,2)
      ERROR = 1
      IF (CROPNE(1).EQ.'WWHE'.OR.CROPNE(1).EQ.'WBAR'.OR.CROPNE(1)
     & .EQ.'SWHE'.OR.CROPNE(1).EQ.'SBAR'.OR.CROPNE(1).EQ.'OATS'
     & .OR.CROPNE(1).EQ.'POTA'.OR.CROPNE(1).EQ.'TURN'.OR.
     &  CROPNE(1).EQ.'SWED') ERROR = 0
      IF (ERROR.EQ.1) WRITE(LUTT,216)
  216 FORMAT(1H0,' Valid crops are wwheat,wbarley,swheat,sbarley,
     & oats,potatoes,Turnips,and Swedes.',/,
     &  'Please correct your entry .',/)
      IF (ERROR.NE.0) GOTO 200
c
  280 WRITE(LUTT,290)
  290 FORMAT(1H ,'  value            (/tonne)',$)
      CALL PGR(LUTT,LUTT,2,CROPVT,10.2,8,0.00,150.00,ERROR)
      IF (ERROR.NE.0) GOTO 280
c
c     Write data to file.
c
      WRITE(LUDA'ACREC) INTR,INFR,INVR,TAXR,FCOSTL,LCOSTH,TSHCY,IMSHCY,
     &                  TTAXCY,CROPNE,CROPVT
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

7.8 SOIL WORKABILITY DAYS AND CROP DATA

```
c
c     Assign work days data.
c
c     Open data file.
c
      IF (PROB.EQ.080.AND.SSNAME(1).EQ.'WINT') GOTO 100
      IF (PROB.EQ.090.AND.SSNAME(1).EQ.'WINT') GOTO 110
      IF (PROB.EQ.100.AND.SSNAME(1).EQ.'WINT') GOTO 120
      IF (PROB.EQ.080.AND.SSNAME(1).EQ.'DARV') GOTO 200
      IF (PROB.EQ.090.AND.SSNAME(1).EQ.'DARV') GOTO 210
      IF (PROB.EQ.100.AND.SSNAME(1).EQ.'DARV') GOTO 220
      IF (PROB.EQ.080.AND.SSNAME(1).EQ.'MACM') GOTO 230
      IF (PROB.EQ.090.AND.SSNAME(1).EQ.'MACM') GOTO 240
      IF (PROB.EQ.100.AND.SSNAME(1).EQ.'MACM') GOTO 250
c
c     Winton soil series.
c
  100 WRITE(LUTT,101)
  101 FORMAT(1H0,' There is no 80% probability data for the Winton',
     &       ' soil series.',/)
      CALL EXIT
  110 FILNAM(1) = 'MS10'
      FILNAM(2) = '90.D'
      GOTO 1000
  120 FILNAM(1) = 'MS11'
      FILNAM(2) = '00.D'
      GOTO 1000
c
c     Darvel soil series.
c
  200 FILNAM(1) = 'MS20'
      FILNAM(2) = '80.D'
      GOTO 1000
  210 FILNAM(1) = 'MS20'
      FILNAM(2) = '90.D'
      GOTO 1000
  220 FILNAM(1) = 'MS21'
      FILNAM(2) = '00.D'
      GOTO 1000
c
c     Macmerry soil seies.
c
  230 FILNAM(1) = 'MS30'
      FILNAM(2) = '80.D'
      GOTO 1000
  240 FILNAM(1) = 'MS30'
      FILNAM(2) = '90.D'
      GOTO 1000
  250 FILNAM(1) = 'MS31'
      FILNAM(2) = '00.D'
      GOTO 1000
c
 1000 CONTINUE
c
      FILNAM(3) = 'AT  '
```

APPENDIX 5 cont'd

```
c
      OPEN(UNIT=LUDA,NAME=FILNAM,TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED')
c
c     Read work days data from file. Assign correct field to array.
c
      DO 1020 I=1,52
        READ(LUDA,1010) IFIELD(1),IFIELD(2),IFIELD(3),IFIELD(4)
 1010   FORMAT(I2,3(X,I1))
        IF (WABY.EQ.100) WDAYS(I) = IFIELD(2)
        IF (WABY.EQ.105) WDAYS(I) = IFIELD(3)
        IF (WABY.EQ.110) WDAYS(I) = IFIELD(4)
 1020 CONTINUE
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      IF (CROPNE(1).EQ.'WWHE') GOTO 1071
      IF (CROPNE(1).EQ.'WBAR') GOTO 1072
      IF (CROPNE(1).EQ.'SWHE') GOTO 1073
      IF (CROPNE(1).EQ.'SBAR') GOTO 1074
      IF (CROPNE(1).EQ.'OATS') GOTO 1075
      IF (CROPNE(1).EQ.'POTA') GOTO 1076
      IF (CROPNE(1).EQ.'TURN') GOTO 1077
      IF (CROPNE(1).EQ.'SWED') GOTO 1078
c
      WRITE(LUTT,1111) CROPNE
 1111 FORMAT(1H ,'IN MSWDD CROP NAME IS ',4(A4))
 1071 OPTDN = 296
      MAXY  = 6.20
      CPA   = 0.00444
      CPB   = 0.00435
      GOTO 9000
c
c     Winter barley parameters.
c
 1072 OPTDN = 288
      MAXY  = 5.95
      CPA   = 0.00310
      CPB   = 0.00384
      GOTO 9000
c
c     Spring wheat parameters.
c
 1073 OPTDN = 76
      MAXY  = 3.83
      CPA   = 0.00878
      CPB   = 0.0109
      GOTO 9000
c
c     Spring barley parameters.
c
 1074 OPTDN = 76
      MAXY  = 4.88
      CPA   = 0.00911
      CPB   = 0.01102
      GOTO 9000
c
c     Oats parameters.
```

APPENDIX 5 cont'd

```
c
 1075 OPTDN = 81
      MAXY  = 4.92
      CPA   = 0.01346
      CPB   = 0.01941
      GOTO 9000
c
c     Potatoes parameters.
 1076 OPTDN = 104
      MAXY  = 42.21
      CPA   = 0.00581
      CPB   = 0.00913
      GOTO 9000
c
c     Turnips parameters.
 1077 OPTDN = 138
      MAXY  = 6.44
      CPA   = 0.04964
      CPB   = 0.03174
      GOTO 9000
c
c     Swedes parameters.
c
 1078 OPTDN = 125
      MAXY  = 5.27
      CPA   = 0.01722
      CPB   = 0.01843
      GOTO 9000
c
 9000 CONTINUE
c     Close data file.
c
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

8 COMBINATION SELECTION

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSCS.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=CSRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXCS)
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'  COMBINATION SELECTION   ')
   20 FORMAT(1H0,'  -----------------------')
c
c     Record number.
c     Units: none.
c
c     Prevent record number 0 being selected.
c     IF (CSREC.EQ.0) CSREC = 1
c 100 CALL LINE(LUTT)
c     WRITE(LUTT,110)
c 110 FORMAT(1H ,'  combination number      ',$)
c     CALL PGI(LUTT,LUTT,5,CSREC,4,11,1,MAXCS,ERROR)
c     IF (ERROR.NE.0) GOTO 100
      CSREC = 1
c
c     Read data from file.
c
      READ(LUDA'CSREC) NA01RS,A01R,A02R,A03R,AOR,NC01RS,C01R,NSSRS,TYPE,
     &                 SSR,NOCRS,OCR,NACRS,ACR,NF01RS,F01R,NIOORS,IOOR
c
c     Type of tractor used.
c
  120 CALL LINE(LUTT)
      WRITE(LUTT,130)
      WRITE(LUTT,131)
      WRITE(LUTT,132)
      WRITE(LUTT,133)
  130 FORMAT(1H0,'  Type                  ')
  131 FORMAT(1H ,'  2-wheel drive       (2WD)')
  132 FORMAT(1H ,'    4-unequal wheel  (UNE4)')
  133 FORMAT(1H ,'    4-equal wheel    (EQ4W)',$)
      RARRAY(1) = TWOWD
      RARRAY(2) = UNE4
      RARRAY(3) = EQ4W
      CALL PGA(LUTT,LUTT,5,TYPE,4,11,RARRAY,3,ERROR)
      IF (ERROR.NE.0) GOTO 120
c
c     Assign number of tractor record.
c     Units: none.
c
  134 CALL LINE(LUTT)
  135 WRITE(LUTT,136)
  136 FORMAT(1H ,'  no. of tractor records  ',$)
      CALL PGI(LUTT,LUTT,5,NA01RS,4,11,1,MAXA01,ERROR)
      IF (ERROR.NE.0) GOTO 134
c
```

APPENDIX 5 cont'd

```
c
c     2-or uequal 4- or equal 4-wheel drive drive tractor records.
c     Units: none.
c
      DO 155 I = 1,NA01RS
      IF (TYPE.EQ.TWOWD) A0R(I) = A01R(I)
      IF (TYPE.EQ.UNE4)  A0R(I) = A02R(I)
      IF (TYPE.EQ.EQ4W)  A0R(I) = A03R(I)
  140 WRITE(LUTT,150) I
  150 FORMAT(1H ,'  tractor record number ',I2,$)
      CALL PGI(LUTT,LUTT,5,A0R(I),4,11,1,20,ERROR)
      IF (ERROR.NE.0) GOTO 140
        IF (TYPE.EQ.TWOWD) A01R(I) = A0R(I)
        IF (TYPE.EQ.UNE4 ) A02R(I) = A0R(I)
        IF (TYPE.EQ.EQ4W ) A03R(I) = A0R(I)
  155 CONTINUE
c
c     Number of mould board plough records.
c     Units: none.
c
  160 CALL LINE(LUTT)
      WRITE(LUTT,170)
  170 FORMAT(1H ,'  mould board ploughs        ',$)
      CALL PGI(LUTT,LUTT,5,NC01RS,4,11,1,MAXC01,ERROR)
      IF (ERROR.NE.0) GOTO 160
c
      DO 200 I=1,NC01RS
c
c     Mould-board plough records.
c     Units: none.
c
  180 WRITE(LUTT,190) I
  190 FORMAT(1H ,'  mould board plough    ',I2,$)
      CALL PGI(LUTT,LUTT,5,C01R(I),4,11,1,MAXC01,ERROR)
      IF (ERROR.NE.0) GOTO 180
  200 CONTINUE
c
c     Number of soil specification records.
c     Units: none.
c
  205 CALL LINE(LUTT)
      WRITE(LUTT,210)
  210 FORMAT(1H ,'  soil specifications      ',$)
      CALL PGI(LUTT,LUTT,5,NSSRS,4,11,1,MAXSS,ERROR)
      IF (ERROR.NE.0) GOTO 205
c
      DO 300 I=1,NSSRS
c
c     Soil specification records.
c     Units: none.
c
  220 WRITE(LUTT,230) I
  230 FORMAT(1H ,'  soil specification      ',I2,$)
      CALL PGI(LUTT,LUTT,5,SSR(I),4,11,1,MAXSS,ERROR)
      IF (ERROR.NE.0) GOTO 220
  300 CONTINUE
c
c     Number of operating condition records.
c     Units: none.
c
```

APPENDIX 5 cont'd

```
  240 CALL LINE(LUTT)
      WRITE(LUTT,250)
  250 FORMAT(1H ,'  operating conditions    ',$)
      CALL PGI(LUTT,LUTT,5,NOCRS,4,11,1,MAXOC,ERROR)
      IF (ERROR.NE.0) GOTO 240
c
      DO 400 I=1,NOCRS
c
c     Operating condition records.
c     units: none.
c
  260 WRITE(LUTT,270) I
  270 FORMAT(1H ,'  operating condition   ',I2,$)
      CALL PGI(LUTT,LUTT,5,OCR(I),4,11,1,MAXOC,ERROR)
      IF (ERROR.NE.0) GOTO 260
  400 CONTINUE
c
c     Number of additional cost records.
c     Units: none.
c
  280 CALL LINE(LUTT)
      WRITE(LUTT,290)
  290 FORMAT(1H ,'  additional costs      ',$)
      CALL PGI(LUTT,LUTT,5,NACRS,4,11,1,MAXAC,ERROR)
      IF (ERROR.NE.0) GOTO 280
c
      DO 500 I=1,NACRS
c
c     Additional cost records.
c     Units: none.
c
  310 WRITE(LUTT,320) I
  320 FORMAT(1H ,'  additional cost       ',I2,$)
      CALL PGI(LUTT,LUTT,5,ACR(I),4,11,1,MAXAC,ERROR)
      IF (ERROR.NE.0) GOTO 310
  500 CONTINUE
c
c     Number of direct drill records.
c     Units: none.
c
  330 CALL LINE(LUTT)
      WRITE(LUTT,340)
  340 FORMAT(1H ,'  direct drills         ',$)
      CALL PGI(LUTT,LUTT,5,NF01RS,4,11,1,MAXF01,ERROR)
      IF (ERROR.NE.0) GOTO 330
c
      DO 600 I=1,NF01RS
c
c     Direct drill records.
c     Units: none.
c
  350 WRITE(LUTT,360) I
  360 FORMAT(1H ,'  direct drill          ',I2,$)
      CALL PGI(LUTT,LUTT,5,F01R(I),4,11,1,MAXF01,ERROR)
      IF (ERROR.NE.0) GOTO 350
  600 CONTINUE
c
c     Number of cultivators records.
c     Units: none.
c
```

APPENDIX 5 cont'd

```
  301 CALL LINE(LUTT)
      WRITE(LUTT,302)
  302 FORMAT(1H ,'  cultivator numbers       ',$)
      CALL PGI(LUTT,LUTT,5,NIOORS,4,11,0,MAXIOO,ERROR)
      IF (ERROR.NE.0) GOTO 301
c
c     Direct cultivator records.
c     Units: none.
c
      DO 307 I=1,NIOORS
c
  304 WRITE(LUTT,306) I
  306 FORMAT(1H ,'  cultivator record      ',I2,$)
      CALL PGI(LUTT,LUTT,5,IOOR(I),4,11,0,MAXIOO,ERROR)
      IF (ERROR.NE.0) GOTO 304
  307 CONTINUE
c
c     Write data to file.
c
      WRITE(LUDA'CSREC)NA01RS,A01R,A02R,A03R,AOR,NC01RS,C01R,NSSRS,TYPE,
     &                 SSR,NOCRS,OCR,NACRS,ACR,NF01RS,F01R,NIOORS,IOOR
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

```
      9  OPEN DATA FILES
      _______________
c
c     Intialise logical units.
c
      LUDA1 = 21
      LUDA2 = 22
      LUDA3 = 23
      LUDA4 = 24
      LUDA5 = 25
      LUDA6 = 26
      LUDA7 = 27
      LUDA8 = 28
      LUDA9 = 29
      LUDA10= 30
c
c     Open 2- or unequal 4- or equal 4-wheel drive tractor data file.
c
      OPEN(UNIT=LUDA1,NAME='MSA01.DAT',TYPE='OLD',
     &      DISPOSE='SAVE',ACCESS='DIRECT',CARRIAGECONTROL='NONE',
     &      FORM='UNFORMATTED',RECORDSIZE=A01RL,ASSOCIATEVARIABLE=NDAR,
     &      MAXREC=MAX01)
c
      OPEN(UNIT=LUDA9,NAME='MSA02.DAT',TYPE='OLD',
     &      DISPOSE='SAVE',ACCESS='DIRECT',CARRIAGECONTROL='NONE',
     &      FORM='UNFORMATTED',RECORDSIZE=A02RL,ASSOCIATEVARIABLE=NDAR,
     &      MAXREC=MAXA02)
c
      OPEN(UNIT=LUDA10,NAME='MSA03.DAT',TYPE='OLD',
     &      DISPOSE='SAVE',ACCESS='DIRECT',CARRIAGECONTROL='NONE',
     &      FORM='UNFORMATTED',RECORDSIZE=A03RL,ASSOCIATEVARIABLE=NDAR,
     &      MAXREC=MAXA03)
c
c     Open mould board plough data file.
c
      OPEN(UNIT=LUDA2,NAME='MSC01.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=C01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXC01)
c
c     Open soil specification data file.
c
      OPEN(UNIT=LUDA3,NAME='MSSS.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=SSRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXSS)
c
c     Open operating conditions data file.
c
      OPEN(UNIT=LUDA4,NAME='MSOC.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=OCRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXOC)
c
c     Open additional costs data file.
c
      OPEN(UNIT=LUDA5,NAME='MSAC.DAT',TYPE='OLD',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=ACRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXAC)
c
```

APPENDIX 5 cont'd

```
c     Open combination selection data file.
c
      OPEN(UNIT=LUDA6,NAME='MSCS.DAT',TYPE='OLD',DISPOSE='SAVE',
     &      ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &      RECORDSIZE=CSRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXCS)
c
c     Open direct drill data file.
c
      OPEN(UNIT=LUDA7,NAME='MSF01.DAT',TYPE='OLD',DISPOSE='SAVE',
     &      ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &      RECORDSIZE=F01RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXF01)
c
c     Open cultivator data file.
c
      OPEN(UNIT=LUDA8,NAME='MSI00.DAT',TYPE='OLD',DISPOSE='SAVE',
     &      ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &      RECORDSIZE=I00RL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXI00)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

10 TECHNICAL CALCULATIONS

10.1 MATCHING SINGLE TRACTOR-IMPLEMENT COMBINATION

```
c
c     Initialise variables.
      ID = 0
c
      RUNS =NA01RS*((MAXPBS-MINPBS)+1)*((MAXPS-MINPS)+1)
c
c     Acceleration due to gravity.
c     Units: m/s2.
c
      G = 9.807
c
c     Open data files.
c
      CALL MSOPEN
c
c     Read combination selection data.
c
      CSREC = 1
      READ(LUDA6'CSREC) NA01RS,A01R,A02R,A03R,AOR,NC01RS,C01R,NSSRS,
     &           TYPE,SSR,NOCRS,OCR,NACRS,ACR,NF01RS,F01R,NI00RS,I00R
c
      WRITE(LUTT,20) RUNS
   20 FORMAT(1H0,' Comparing ',I4,' combinations. Please wait....',/)
c
      WRITE(LURT,40) TYPE
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,70)
      WRITE(LURT,80)
      WRITE(LURT,90)
      WRITE(LURT,97)
      WRITE(LURT,98)
      WRITE(LURT,100)
   40 FORMAT(1H ,'  4-WD (equal) tractor and plough specifications.
     &   ',4(A4),'  ')
   50 FORMAT(1H ,'  --------------------------------  ==========')
   60 FORMAT(1H0, 86('-'))
   70 FORMAT(1H ,'Tr.  Tyre dimensions     Tyre         tractor
     & load     Tractor  Plough          Machine')
   80 FORMAT(1H ,'      --------------        pressure     distribution
     & used  ---------          age, yr')
   90 FORMAT(1H ,'      front      rear     ----------- -------------
     &---      Bod angle ----------------')
   97 FORMAT(1H , 23X,'front  rear front front  rear',9x,'ies',7x,'Pur-
     &Pres- Sale')
   98 FORMAT(1H ,'no.    (in)       (in)        (kPa)      (%)   (kN)
     &  (kN) (h/yr)       (rad) chase enst')
  100 FORMAT(1H , 86('-'))
c
c     Assign number of tractors for this run.
c
```

APPENDIX 5 cont'd

```
      DO 11 I = 1,NA01RS
      IF (TYPE.EQ.TWOWD) GOTO 9201
      IF (TYPE.EQ.UNE4 ) GOTO 9202
      IF (TYPE.EQ.EQ4W ) GOTO 9203
c
c     Read specific tractor type data.
c
 9201 IF (TYPE.EQ.TWOWD) AOR(I)=A01R(I)
      A01REC=A01R(I)
      READ(LUDA1'A01REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                   FLDD,WBAS
      GOTO 9204
 9202 IF (TYPE.EQ.UNE4 ) AOR(I)= A02R(I)
      A02REC=A02R(I)
      READ(LUDA9'A02REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRM,FINFP,
     &                   FLDD,WBAS
      GOTO 9204
 9203 IF (TYPE.EQ.EQ4W ) AOR(I)= A03R(I)
      A03REC=A03R(I)
      READ(LUDA10'A03REC) TNAME,RWLD,TRW,RMD,TINFP,FTW,FRD,FINFP,
     &                    FLDD,WBAS
c
 9204 CONTINUE
c
c     Assign number of mould board ploughs for this run.
c
      DO 22 J1 =1,NC01RS
c
c     Read mould board plough data.
c
      C01REC = C01R(J1)
      READ(LUDA2'C01REC) MINPBS,MAXPBS,PANGLE,IAAP,IPAGE,IAAS
c
c     Assign soil specification for this run.
c
      DO 33 K1 =1,NSSRS
c
c     Read soil specification data.
c
      SSREC = SSR(K1)
      READ(LUDA3'SSREC)  SSNAME,PCLAY,PSILT,PSAND,PHUMUS,FC,MCWW,
     &                   MCFC,SBD,DRSAT,DRFC,SLQWW,SLQFC,SPLWW,SPLFC,
     &                   SWPWW,SWPFC,WABY,SKC,SKF,SCR
c
c     Assign operating condition for this run.
c
      DO 44 L =1,NOCRS
c
c     Read operating condition data.
c
      OCREC = OCR(L)
      READ(LUDA4'OCREC)  SWNO,CWNO,FE,PROB,AREA,MINPS,MAXPS,INCPS,
     &                   MINPCD,MAXPCD,INCPCD,PLSDAY,PLCDAY,TTUSEH,
     &                   TAAP,TPAGE,TAAS
c
c     Assign operational cost for this run.
c
      DO 55 M =1,NACRS
c
c     Read operational cost data.
```

APPENDIX 5 cont'd

```
c
      ACREC = ACR(M)
      READ(LUDA5'ACREC)  INTR,INFR,INVR,TAXR,FCOSTL,LCOSTH,TSHCY,IMSHCY,
     &                   TTAXCY,CROPNE,CROPVT
c
c     Assign work day data.
c
      CALL MSWDD
c
      PSS  = MINPS*10.0
      PSNO= MAXPS*10.0
      PBSS = INCPS*10.0
c
      MINPD = MINPCD*100.0
      MAXPD= MAXPCD*100.0
      INCPD= INCPCD*100.0
c
      DO 66 IIII1= MINPD,MAXPD,INCPD
         PCD = IIII1/100.0
            PCW = PCD + 0.05
      DO 77 KBB = MINPBS,MAXPBS,1
         PBS = KBB
      DO 88 JSS = PSS,PSNO,PBSS
         PS = JSS/10.0
c
      IDDD = IDDD + 1
c
c     Calculate soil specific weight, SSW.
c     Units: kN/m3.
c
      SSW = SBD*G
c
c     Calculate soil cone index resistance, CI.
c     Units: MPa.
c
      CI = ((SKC*SCR*(EXP(-0.10*MCWW/(1+SCR))))+(SKF*SSW/(1+2*SCR)))*
     &      (EXP(3.1415927/(1+2*SCR)))
c
c     Calculate plough weight, PWT.
c     Units: kN.
c
      PWT = ((7.77 + (147.86*PBS))*9.807)/1000.0
c
c     Calculate total static weight on the tractor, rear and front
c     wheel Sstatic load  PTWT, WDLD & FWLD.
c     Units: kN.
c
      IF (TYPE.EQ.TWOWD) GOTO 9206
      IF (TYPE.EQ.UNE4 ) GOTO 9207
      IF (TYPE.EQ.EQ4W ) GOTO 9208
 9206 IF (TYPE.EQ.TWOWD) PTWT=((2.0*RWLD*9.807/1000.0)/(1-(FLDD/100.0)))
     &                   -PWT
      GOTO 9209
 9207 IF (TYPE.EQ.UNE4 ) PTWT=((2.0*RWLD*9.807/1000.0)/(1-(FLDD/100.0)))
     &                   -PWT
      GOTO 9209
 9208 IF (TYPE.EQ.EQ4W ) PTWT=((4.0*RWLD*9.807)/1000.0)-PWT
 9209 CONTINUE
c
      FWLD = PTWT*(FLDD/100.0)/2.0
```

APPENDIX 5 cont'd

```
      WDLD = (PTWT-(2.0*FWLD))/2.0
c
c     Calculate front and rear wheel section width, FWW & RWW.
c     Units: m.
c
      FWW = FTW*2.54/100.0
      RWW = TRW*2.54/100.0
c
c     Calculate front and rear wheel section height, FTSH & TRSH.
c     Units: m.
c
      FTSH = FWW*0.75
      TRSH = RWW*0.75
c
c     Calculate front and rear tyre deflection, FTDF & TRDF.
c     Units: m.
c
      FTDF = FTSH*0.20
      TRDF = TRSH*0.20
c
c     Calculate front and rear wheel diameter, FTD & TRD
c     Units: m.
c
      FWD = (FRD*2.54/100.0)+2.0*FTSH
      TRD = (RMD*2.54/100.0)+2.0*TRSH
c
c     Calculate BF, BR for front and rear wheels.
c     Units: none.
c
      BF = (1000.0*CI*FWW*FWD*((FTDF/FTSH)**0.50))/
     &     (1+(FWW/(2.0*FWD)))
      BR = (1000.0*CI*RWW*TRD*((TRDF/TRSH)**0.50))/
     & (1+(RWW/(2.0*TRD)))
c
c     Calculate tractor rear axle load after transferred takes place, TWR.
c     Units: kN.
c
c     ------------------------------ for two-wheel drive tractor.
      IF (TYPE.EQ.TWOWD) TWR=((1-(0.049*TRD/(2.0*WBAS)))-
     &   ((((1-(0.049*TRD/(2.0*WBAS)))**2.0)-(4.0*2.0*WDLD*
     & 0.287*TRD/(2.0*WBAS*BR)))**0.5))/
     & (2.0*0.287*TRD/(2.0*WBAS*BR))
c
c     ----------------------------- For four-unequal wheel drive tractor.
      IF (TYPE.EQ.UNE4 ) TWR=(((2.0*0.287*PTWT*TRD/(2.0*BF*WBAS))
     &   +1)-((((((2.0*0.287*PTWT*TRD/(2.0*BF*WBAS))+1)**2.0)-
     & ((4.0*0.287*TRD*(BF+BR)/(2.0*WBAS*BF*BR))*(((PTWT*TDR/
     & (2.0*WBAS))*((0.287*PTWT/BF)+0.049))+2.0*WDLD)))**0.5))/
     &   (2.0*0.287*TRD*(BF+BR)/(2.0*WBAS*BF*BR))
c     --------------------------- for four-equal wheel drive tractor.
      IF (TYPE.EQ.EQ4W ) TWR=(((2.0*0.287*PTWT*TRD/(2.0*BF*WBAS))
     & +1)-((((((2.0*0.287*PTWT*TRD/(2.0*BF*WBAS))+1)**2.0)-
     &   ((4.0*0.287*TRD*(BF+BR)/(2.0*WBAS*BF*BR))*(((PTWT*TRD/
     & (2.0*WBAS))*((0.287*PTWT/BF)+0.049))+2.0*WDLD)))**0.5))/
     & (2.0*0.287*TRD*(BF+BR)/(2.0*WBAS*BF*BR))
c
c     Calculate dynamic load on the front and rear axle, WF & WR.
c     Units: kN.
c
      WF = PTWT-TWR
```

APPENDIX 5 cont'd

```
      WR = TWR + PWT
c     Calculate front and rear wheel mobility numbers, FMN & WMN.
c     Units: none.
c
      FMN = 2.0*(BF/WF)
      WMN = 2.0*(BR/WR)
c
c     Calculate front and rear wheel slips, FSLIP & RSLIP, and tractor
c     slip, WSLIP.
c     Units: %.
c
      FSLIP = 9.0+(19.0/FMN)
      RSLIP = 9.0+(19.0/WMN)
      IF (TYPE.EQ.TWOWD) WSLIP = RSLIP
      IF (TYPE.EQ.UNE4 ) WSLIP = (FSLIP+RSLIP)/2.0
      IF (TYPE.EQ.EQ4W ) WSLIP = (FSLIP+RSLIP)/2.0
c
c     Calculate front and rear wheel coefficients of rolling resistance,
c     CRRF & CRR.
c     Units: none.
c
      CRRF = 0.049+(0.287/FMN)
      CRR  = 0.049+(0.287/WMN)
c
c     Calculate front and rear axle rolling resistances, RRF & RRR.
c     Units: kN.
c
      RRF = CRRF* (WF/2.0)
      RRR = CRR * (WR/2.0)
c
c     Calculate front and rear wheel maximum coefficients of traction,
c     CTMAXF & CTMAXF.
c     Units : none.
c
      CTMAXF = 0.796-(0.92/FMN)
      CTMAX  = 0.796-(0.92/WMN)
c
c     Calculate front and rear rate constants, FK & RK.
c     Units: none.
c
      FK = (4.838+0.061*FMN)/CTMAXF
      RK = (4.838+0.061*WMN)/CTMAX
c
c     Calculate coefficients of traction, CTF & CT.
c     Units: none.
c
      CTF = CTMAXF*(1-EXP(-FK*(FSLIP/100.0)))
      CT  = CTMAX *(1-EXP(-RK*(RSLIP/100.0)))
c
c     Calculate front and rear axle maximum tractions, TMAXF & TMAXR and
c    the maximum tractor traction, TMAX.
c     Units: kN.
c
      TMAXF = WF*CTMAXF
      TMAXR = WR*CTMAX
      IF (TYPE.EQ.TWOWD) TMAX = WR*CTMAX
      IF (TYPE.EQ.UNE4 ) TMAX = WF*CTMAXF+WR*CTMAX
      IF (TYPE.EQ.EQ4W ) TMAX = WF*CTMAXF+WR*CTMAX
c
c     Calculate rear axle thrust, (TF1 for 2-WD), or
```

APPENDIX 5 cont'd

```
c     --------- front and rear axle thrusts, (TF1 & TR2 for 4-WD), and
c     --------- tractor thrust, TFR.
c     Units: kN.
c
      TF1 = CTF*WF
      TR2 = CT*WR
      IF (TYPE.EQ.TWOWD) TFR = TR2
      IF (TYPE.EQ.UNE4 ) TFR = TF1+TR2
      IF (TYPE.EQ.EQ4W ) TFR = TF1+TR2
c
c     Calculate net tractor drawbar pull, APULL.
c     units: kN.
c
      IF (TYPE.EQ.TWOWD) APULL = TFR-(2.0*RRF)
      IF (TYPE.EQ.UNE4 ) APULL = TFR
      IF (TYPE.EQ.EQ4W ) APULL = TFR
c
c     Calculate travel reduction, TR.
c     Units: km/h.
c
      TR = PS*(WSLIP/100.0)
c
c     Calculate actual travel speed, APS.
c     Units: km/h.
c
      APS = (PS-TR)
c
c     Calculate tractive efficiency from wheel mobility number, TE.
c     Units: %.
c
      IF (TYPE.EQ.TWOWD) TE = 78.0-(55.0/WMN)
      IF (TYPE.EQ.UNE4 ) TE = (2.0*78.0-(55.0/FMN)-(55/WMN))/2.0
      IF (TYPE.EQ.EQ4W ) TE = (2.0*78.0-(55.0/FMN)-(55/WMN))/2.0
c
c     Calculate potential ploughing rate, PPR.
c     Units: ha/h.
c
      PPR = (PCW*APS/10.0)*PBS
c
c     Calculate actual ploughing rate, APR.
c     Units: ha/h.
c
      APR = PPR*FE/100.0
c
c     Calculate horizontal component of plough draught, PD.
c     Units: kN.
c
      PD = (((0.05*1000.0*CI)+(9.66*SSW*((APS/3.6)**2)*(1-COS(PANGLE))/
     &   G))*PCD*PCW)*PBS
c
c     Calculate the torque required at driven wheels, TQ.
c     Units: kNm.
c
      IF (TYPE.EQ.TWOWD) TQ = (TFR+(2.0*RRR))*(TRD/2.0)
      IF (TYPE.EQ.UNE4 ) TQ = (TF1+(2.0*RRF))*(FWD/2.0)+((TR2+(2.0*RRR)
     &                        )/(TRD/2.0))
      IF (TYPE.EQ.EQ4W ) TQ = (TFR+(2.0*(RRF+RRR)))*(TRD/2.0)
c
c     Calculate total pull required, TPULL.
c     Units: kN.
```

APPENDIX 5 cont'd

```
c
      IF (TYPE.EQ.TWOWD) TPULL = TFR + (2.0*(RRF + RRR))
      IF (TYPE.EQ.UNE4 ) TPULL = TFR + (2.0*(RRF + RRR))
      IF (TYPE.EQ.EQ4W ) TPULL = TFR + (2.0*(RRF + RRR))
c
c     Calculate net drawbar power, equivalent power take-off power
c     tractor power required and maximum engine power, DBKW, PTOKW,
c     PTOKW & MAXTEP.
c     Units: kW.
c
      DBKW  = APULL*(APS/3.6)
      PTOKW = ((APULL/0.96)*(APS/3.6)*100.0)/TE
      TPOWER= PTOKW/0.87
      MAXTEP= ((APULL/0.96)*(APS/3.6)*100.0)/(0.87*TE)
c
c     Calculate implement power/ equivalent power-take-off ratio, PTOR.
c     Units: none.
c
      PTOR = PD/APULL
c
c     Calculate total dynamic weight on the tractor, TWT.
c     Units: kN.
c
      TWT = WF + WR
c
c     Calculate tractor weight/power ratio, (kg/kW), TRATIO.
c     Units: none.
c
      IF (TYPE.EQ.TWOWD) TRATIO = (WR*1000.0/9.807)/MAXTEP
      IF (TYPE.EQ.UNE4 ) TRATIO = (TWT*1000.0/9.807)/MAXTEP
      IF (TYPE.EQ.EQ4W ) TRATIO = (TWT*1000.0/9.807)/MAXTEP
c
      IF (TE.LT.0.65) GOTO 118
      IF ((0.75*APULL).GT.PD) GOTO 118
      IF (APULL.LT.PD) GOTO 118
      IF (TRATIO.GT.100.0) GOTO 118
      ID = ID + 1
      PERHR(ID) = APR
      ENGINE(ID) = MAXTEP
      BODIES(ID) = PBS
      DRBKW(ID) = DBKW
      TSLIP(ID) = WSLIP
      SINE(ID) = IDDD
      PTORA(ID) = PTOR
      PTOP(ID) = PTOKW
c
      IF (TYPE.EQ.TWOWD)     CTF = 0.0
      IF (TYPE.EQ.TWOWD)      FK = 0.0
      IF (TYPE.EQ.TWOWD) CTMAXF = 0.0
      IF (TYPE.EQ.TWOWD)    CRRF = 0.0
      IF (TYPE.EQ.TWOWD)     FMN = 0.0
      IF (TYPE.EQ.TWOWD)     TF1 = 0.0
      IF (TYPE.EQ.TWOWD)  TMAXF = 0.0
c
      WRITE(LURT,81) AOR(I),FTW,FRD,TRW,RMD,FINFP,TINFP,FLDD,FWLD,
     &               WDLD,TTUSEH,PBS,PANGLE,TAAP,TPAGE,TAAS
   81 FORMAT(1H ,I2,X,F4.1,'-',F4.1,X,F4.1,'-',F4.1,2(X,F5.1),
     &       3(X,F5.2),X,F6.1,2X,I2,X,F5.2,3X,I2,2(3X,I2))
c
      WRITE(5,1155) IDDD,PCD,PCW,SSW,CI,FWLD,WDLD,PTWT,PWT,TWT,
```

APPENDIX 5 cont'd

```
     &              WF,WR,FWW,RWW,FTSH,TRSH,FTDF,TRDF,FWD,TRD
 1155 FORMAT(1H , I4,4(F8.3),15(F10.3))
      WRITE(9,1151)  FMN,WMN,FSLIP,RSLIP,CRRF,CRR,RRF,RRR,CTMAXF,
     &               CTMAX,CTF,CT,FK,RK,TMAXF,TMAXR,TMAX,TF1,TR2,
     &               TFR,TE,PD,TR,APS,APULL,TPULL,TRATIO,
     &               TPOWER
 1151 FORMAT(1H , 28(F10.4))
c
  118 CONTINUE
   88 CONTINUE
   77 CONTINUE
   66 CONTINUE
   55 CONTINUE
   44 CONTINUE
   33 CONTINUE
   22 CONTINUE
   11 CONTINUE
c
      CLOSE(UNIT=5)
      CLOSE(UNIT=9)
      WRITE(LURT,91)
   91 FORMAT(1H0,  86('-'))
c
```

10.2 MULTIPLE TRACTOR-IMPLEMENT COMBINATIONS

```
c
c     Calculate the time span for ploughing.
c     Units: days
c
      PDAYSW = PLCDAY-(PLSDAY-1)
      EXFPWN = PLCDAY/7.0
c
c     Calculate tractor fleet for specified area.
c     Units: none.
c
      PAREA = 0
      TAPR  = 0
      IDD = 0
      DO 112 II = 1,ID
      DO 110 III =1,6
      PAREA = PAREA+(8.0*PERHR(II)*PDAYSW)
      TAPR = TAPR+PERHR(II)
      IF (PAREA.GE.AREA) GOTO 111
  110 CONTINUE
  111 NOTR(II) = III
      IDD = IDD + 1
c
c     Calculate ploughing hours for specified area.
c     Units: hr.
c
      PHOURS(IDD) = AREA/TAPR
c
c     Calculate proportion of annual tractor use in ploughing.
c     Units: none.
c
      FTPH(IDD) = PHOURS(IDD)/TTUSEH
      TCAPR(IDD) = TAPR
c
```

APPENDIX 5 cont'd

```
      RUN(IDD) = II
      TCAPR(IDD) = TAPR
      PAREA = 0
      TAPR  = 0
  112 CONTINUE
c
      10.3  COSTING ROUTINES
      ______________________

      10.3.1  TRACTOR AND PLOUGH COSTS
      ________________________________
c
      M = 1
      I = 1
      WRITE(LURT,1011)  TYPE
      WRITE(LURT,1012)
      WRITE(LURT,1013)
      WRITE(LURT,1014)
      WRITE(LURT,1015)
      WRITE(LURT,1016)
      WRITE(LURT,1017)
      WRITE(LURT,1018)
 1011 FORMAT(1H0,'Table 3b  Summary of 4-WD (equal) tractor output costi
     &ng routine.  ',4(A4),'  ')
 1012 FORMAT(1H0,  100('_'))
 1013 FORMAT(1H ,'Sale Power Purchase Mortgage  Ratio  Sum    Sum   Salv
     &age  Net    Sum    Sum    Balancing Present')
 1014 FORMAT(1H ,' age  units. price    value      of    repair insur-  val
     &ue  present  capital interest charge    annual')
 1015 FORMAT(1H ,'                                     (1+g)  cost   ance',10x,
     &'mortgage allow-  charge',13x,'cost')
 1016 FORMAT(1H ,31x,'to          cost           value        ance')
 1017 FORMAT(1H ,'(Yr)  (kW)   ($)        ($)       (1+i)  ($)      ($)     ($
     &)   ($)      ($)      ($)      ($)      ($)')
 1018 FORMAT(1H ,   100('_'))
c
      DO 979 NN = 1,ID
c
      TLIFE = TAAS-TAAP
      N = TPAGE
c     Wear constant = 1000.
      TWEARH = 1000.0
c
      ILIFE = IAAS-IAAP
      N1 = IPAGE
c     Calculate tractor purchase price.
c     Units: currency units.
c
      IF (TYPE.EQ.TWOWD) TPP = 2001.78+(191.18*ENGINE(NN))
      IF (TYPE.EQ.UNE4 ) TPP = 47.87 + (263.81*ENGINE(NN))
      IF (TYPE.EQ.EQ4W ) TPP = -314.64+(306.49*ENGINE(NN))
c
c     Calculate plough purchase price.
c     Units: currency units.
c
      PPP = -249.32+371.90*PCW+492.96*BODIES(NN)
c
```

APPENDIX 5 cont'd

```
c     Calculate ratio of inflation to interest rate.
c     Units: none.
c
      FL = (1+INFR)/(1+INVR)
c
c     Calculate tractor resale price after TLIFE years.
c     Units: currency units.
c
      A1 = 78.2
      B1 = 0.825
      TSALV = A1*(B1**TLIFE)*(TPP/100.0)*((1+INFR)**TLIFE)
c
c     Calculate plough resale value after ILIFE years.
c     Units: currency units.
c
      A2 = 60.0
      B2 = 0.885
      PSALV = A2*(B2**ILIFE)*(PPP/100.0)*((1+INFR)**ILIFE)
c
c     Calculate tractor repair cost.
c     Units: currency units.
c
      IT = TTUSEH
      IW = TWEARH
      X(NN)=(0.012*(((N*IT/IW)**2.033)-(((N-1)*IT/IW)**2.033)))*100.0
      XXX = X(NN)*FTPH(NN)
      TREPC = (X(NN)/100.0)*(TPP*((1+INFR)**N))
      TPREPC = TREPC*(PHOURS(NN)/TTUSEH)
c
c     Calculate plough repair cost.
c     Units: currency units.
c
      IP = AREA/NOTR(NN)
      Z=(0.36*(((N1*IP/IW)**1.81)-(((N1-1)*IP/IW)**1.81)))*100.0
      PREPC = (Z/100.0)*(PPP*((1+INFR)**N1))
c
c     Calculate tractor and plough annual capital allowance value.
c     Units: currency units.
c
      TCAV = 0.25*(0.75**(N-1))*TPP
      PCAV = 0.25*(0.75**(N1-1))*PPP
c
c     Calculate tractor and plough Mortgage value.
c     Units: currency units.
c
      TMORTV = TPP*((1+INTR)**TLIFE)*INTR/(((1+INTR)**TLIFE)-1)
      PMORTV = PPP*((1+INTR)**ILIFE)*INTR/(((1+INTR)**ILIFE)-1)
c
c     Calculate tractor and plough actual interest charge.
c     Units: currency unit.
c
      TAINTC =(TPP*(((1+INTR)**TLIFE)-((1+INTR)**(N-1)))*INTR)/
     &        (((1+INTR)**TLIFE)-1)
      PAINTC=(PPP*(((1+INTR)**ILIFE)-((1+INTR)**(N1-1)))*INTR)/
     &        (((1+INTR)**ILIFE)-1)
c
c     Calculate tractor and plough net Present mortgage value.
c     Units: currency unit.
c
      TNPMV=TPP*(INTR/INVR)*(((1+INTR)**TLIFE)/(((1+INVR)**
```

APPENDIX 5 cont'd

```
     &      TLIFE))*((((1+INVR)**TLIFE)-1)/(((1+INTR)**TLIFE)-1))
      PNPMV=PPP*(INTR/INVR)*(((1+INTR)**ILIFE)/(((1+INVR)**
     &      ILIFE))*((((1+INVR)**ILIFE)-1)/(((1+INTR)**ILIFE)-1))
c
c      ==================================================
c      Insurance premiums for tractor and implement.
c      Purchase price                  premium
c        up to $1000                   $25.0
c        up to $5000                   $1.2*Resale  value/100.0
c        up to $15000                  $0.95*Resale value/100.0
c        up to $40000                  $0.85*Resale value/100.0
c      ==================================================
c
c     Calculate (SUM) tractor accumulated repair hours, % of
c                 repair cost.
c     -------- (SUM51) accumulated annual capital allowance value.
c     -------- (TBC) tractor final balancing charge.
c     -------- (SUM52) accumulated actual interest charge.
c     -------- (TRSALV) resale value of tractor for each year of ownership.
c     -------- (TINSCY) tractor insurance for each year of ownership.
c     Calculate (TPANC) present annual cost of tractor.
c     Units: currency units.
c
      SUM = 0.0
      SUM11 = 0
      SUM12 = 0
      SUM13 = 0
      SUM50 = 0
      SUM51 = 0
      SUM52 = 0
      DO 300 K = 1,TLIFE
      SUM=SUM+((0.012*(((K*IT/IW)**2.033)-(((K-1)*IT/IW)**
     &        2.033)))*TPP*(FL**K))
      SUM50 = SUM50+((0.25*(0.75**(K-1)))*TPP)
      SUM51 = SUM51+((0.25*(0.75**(K-1)))*TPP/((1+INVR)**K))
      SUM52 = SUM52+((TPP*((((1+INTR)**TLIFE)-((1+INTR)**(K-1)))*
     &      INTR)/(((1+INTR)**TLIFE)-1))/((1+INVR)**K))
      TRSALV(K) = 78.2*(0.825**(K-1))*(TPP/100.0)
      IF (TRSALV(K).LE.1000.0)  TINP(K)= 25.0
      IF (TRSALV(K).GT.1000.0.AND.TRSALV(K).LE.5000.0)  TINP(K)=25.0+
     &                                  (1.2*((TRSALV(K)-1000.0)/100.0))
      IF (TRSALV(K).GT.5000.0.AND.TRSALV(K).LE.15000.0) TINP(K)=25.0+
     &  (1.2*((5000.0-1000.0))/100.0)+(0.95*((TRSALV(K)-5000.0)/100.0))
      IF (TRSALV(K).GT.15000.0.AND.TRSALV(K).LE.40000.0) TINP(K)=25.0+
     &  (1.2*((5000.0-1000.0)/100.0))+(0.95*((15000.0-5000.0)/100.0))+
     &                                 (0.85*((TRSALV(K)-15000.0)/100.0))
      SUM11 = SUM11+(TINP(K)*(FL**K))
      SUM12 = SUM12+(TINP(K)*((1+INFR)**K))
      IF ((K-1).EQ.0)  SUM13 = 0
      IF ((K-1).NE.0)  SUM13 = SUM13 +(TINP(K-1)*((1+INFR)**(K-1)))
  300 CONTINUE
      TBC = (SUM50+TSALV-TPP)/((1+INVR)**TLIFE)
      TPANC(NN)= (TNPMV-(TAXR*(SUM51+SUM52))+(TBC*TAXR)+((1-TAXR)*
     &        (SUM+SUM11))-(TSALV/((1+INVR)**TLIFE)))*(FL-1)/(FL*
     &        ((FL**TLIFE)-1))
      TPPANC = TPANC(NN)*(PHOURS(NN)/TTUSEH)
      TINSCY = SUM12-SUM13
c
c     Calculate (SUM1) plough accumulated use hours, % repair cost of purchase.
c     --------- (SUM61) accumulated annual capital allowance value.
```

APPENDIX 5 cont'd

```
c     --------- (SUM62) plough final balancing charge.
c     --------- (PINSCY) plough insurance for each year of ownership.
c     --------- (PRSALV) resale value of plough for each year of ownership.
c     Calculate present annual cost of plough.
c     Units: currency units.
c
      SUM1 = 0.0
      SUM21 = 0
      SUM22 = 0
      SUM23 = 0
      SUM60 = 0
      SUM61 = 0
      SUM62 = 0
      DO 400 J = 1,ILIFE
      SUM1=SUM1+((0.36*(((J*IP/IW)**1.81)-(((J-1)*IP/IW)**
     &       1.81)))*PPP*(FL**J))
      PRSALV(J) = 60.0*(0.885**(J-1))*(PPP/100.0)
      IF (PRSALV(J).LE.1000.0)   PINP(J)=25.0
      IF (PRSALV(J).GT.1000.0.AND.PRSALV(J).LE.5000.0)   PINP(J)=25.0+
     &                                (1.2*((PRSALV(J)-1000.0)/100.0))
      IF(PRSALV(J).GT.5000.0.AND.PRSALV(J).LE.15000.0)  PINP(J)=25.0+
     &  (1.2*((5000.0-1000.0)/100.0))+(0.95*((PRSALV(J)-5000.0)/100.0))
      IF (PRSALV(J).GT.15000.0.AND.PRSALV(J).LE.40000.0)  PINP(J)=25.0+
     &  (1.2*((5000.0-1000.0)/100.0))+(0.95*((15000.0-5000.0)/100.0))+
     &                               (0.85*((PRSALV(J)-15000.0)/100.0))
      SUM21 = SUM21+(PINP(J)*(FL**J))
      SUM22 = SUM22+(PINP(J)*((1+INFR)**J))
      IF((J-1).EQ.0)  SUM23= 0
      IF((J-1).NE.0)  SUM23 = SUM23+(PINP(J-1)*((1+INFR)**(J-1)))
      SUM60 = SUM60+((0.25*(0.75**(J-1)))*PPP)
      SUM61 = SUM61+((0.25*(0.75**(J-1)))*PPP/((1+INVR)**J))
      SUM62 = SUM62+((PPP*((((1+INTR)**ILIFE)-((1+INTR)**(J-1)))*
     &   INTR)/(((1+INTR)**ILIFE)-1))/((1+INVR)**J))
  400 CONTINUE
      PBC = (SUM60+PSALV-PPP)/((1+INVR)**ILIFE)
      PPANC = (PNPMV-(TAXR*(SUM61+SUM62))+(TAXR*PBC)+((1-TAXR)*(SUM1
     &      +SUM21))-(PSALV/((1+INVR)**ILIFE)))*(FL-1)/(FL*((FL**
     &   ILIFE)-1))
      PINSCY = SUM22-SUM23
c
c     Calculate tractor annual cash flow.
c     Units: currency units/year.
c
      TACF = (TPP-TSALV)*(FL**(TLIFE-1))*(FL-1)/((FL**TLIFE)-1)
c
c     Calculate tractor and plough shelter cost.
c     Units: currency unit.
c
      TSHTCY = 0.010*TPP
      PSHTCY = 0.010*PPP
c
c     Calculate plough annual cash flow.
c     Units: currency units/year.
c
      PACF = (PPP-PSALV)*(FL**(ILIFE-1))*(FL-1)/((FL**ILIFE)-1)
c
c     Calculate tractor fuel cost for ploughing.
c     Units: currency units/hour.
c
      TFUCT(NN)=(2.64*PTORA(NN)+3.91-0.2*((738*PTORA(NN)+173)**0.5))*
```

APPENDIX 5 cont'd

```
     &        PTOP(NN)*PHOURS(NN)*FCOSTL
c
c     Calculate labour cost of ploughing operation.
c     Units: currency units.
c
      TLCOST = PHOURS(NN)*LCOSTH
c
c     Calculate number of days and penalty days required to complete
c     ploughing operation.
c     Units: none.
c
      PDAYSR = PHOURS(NN)/8.0
      CPDAYN = (PLSDAY-1) + PDAYSR
      PWDAYS  = 0
         J3 = SWNO
            J4 = J3 + 52
      DO 301 JJ1 = J3,J4
            JJJ = JJ1
      IF (JJJ.GT.52) JJJ = JJJ-52
      PWDAYS = PWDAYS + WDAYS(JJJ)
      IF (PWDAYS.GE.PDAYSR) GOTO 302
 301  CONTINUE
 302  WEEKNO = JJJ
      IF (WEEKNO.LE.CWNO)  PWEEKS = 0
      IF (PWDAYS.LE.PDAYSW) PDAYS = 0
      IF (PWDAYS.LE.PDAYSW) PDAYNO = PLCDAY
      IF (PWDAYS.GT.PDAYSW) PDAYS = PWDAYS-PDAYSW
      IF (PWDAYS.GT.PDAYSW) PDAYNO = PLCDAY + PDAYS
      IF (WEEKNO.GT.CWNO) WEEKS = WEEKNO - CWNO
      FPDAYN(NN) = PDAYNO
      RPDS(NN) = PDAYSR
      PWWN(NN) = WEEKNO
c
c     Calculate other operation cost.
c     Units: currency units.
c
      OPCOST = ((TSHTCY+TTAXCY+TINSCY)*(PHOURS(NN)/TTUSEH))+(PSHTCY+
     &           PINSCY)
      FTORC(I) = TSHTCY + TTAXCY + TINSCY
c
c     Calculate tractor and plough combination cost.
c     Units: currency units.
c
      TSCOST = TPPANC + PPANC + TFUCT(NN) + TLCOST + OPCOST
      TCCOST(NN) = TSCOST
      TPRCC(NN) = TREPC
      YLCCOT(NN) = TCCOST(NN)*NOTR(NN)
c
c     Write technical and financial results in the file attached
c     to logical unit LUCALC.
c
      WRITE(LURT,1019) TAAS,ENGINE(I),TPP,TMORTV,FL,SUM,SUM11,TSALV,
     &                 TNPMV,SUM51,SUM52,TBC,TPANC(I)
 1019 FORMAT(1H ,I2,I7,F9.1,F10.1,F7.3,F7.1,F7.1,F8.1,F8.1,F9.1,F8.1,
     &           F9.1,F9.1)
c
      WRITE(7,701) WEEKNO,PDAYS,CPDAYN,TINSCY,PINSCY,
     &    TPP,PPP,TSALV,PSALV,X(I),XXX,Z,TREPC,TPREPC,
     &        PREPC,TPPANC,PPANC,TACF,PACF,TLCOST,OPCOST,
```

APPENDIX 5 cont'd

```
   &        TSHTCY,PSHTCY,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
   &        TNPMV,PNPMV,TBC,PBC,SUM,SUM11,SUM51,SUM52,SUM1,SUM22,
   &    SUM61,SUM62
 701 FORMAT(1H , 3(I6),6(F10.2),3(F8.3),7(F11.2),2(F12.2),2(F12.2),
   &         10(F10.2),8(F10.2))
c
3033 CONTINUE
     M = M + 1
     I = I + 1
 979 CONTINUE
     WRITE(LURT,1067)
     WRITE(LURT,1068)
1067 FORMAT(1H ,  100('-'))
1068 FORMAT(1H0,'   i = investment interest rate. ',/,'    g = inflat
    &ion rate. ')
     CLOSE(UNIT=7)
c
C
     OPEN(UNIT=7,NAME='MSCALC7.RES',TYPE='UNKNOWN',
    &   ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
     WRITE(LURT,1031)
     WRITE(LURT,1032)
     WRITE(LURT,1033)
     WRITE(LURT,1034)
     WRITE(LURT,1035)
     WRITE(LURT,1036)
     WRITE(LURT,1037)
     WRITE(LURT,1038)
1031 FORMAT(1H0,'Table 8.6  Summary of plough output costing rout
    &ine.')
1032 FORMAT(1H0,  102('_'))
1033 FORMAT(1H ,'Sale Bodies Purchase Mortgage  Ratio   Sum   Sum   Sal
    &vage Net      Sum      Sum    Balancing Present')
1034 FORMAT(1H ,' age          price    value     of   repair insur-  va
    &lue  present  capital  allow-    charge   annual')
1035 FORMAT(1H ,'                                (1+g)  cost    ance',10x
    &,'mortgage  allow-  charge              cost')
1036 FORMAT(1H ,'                                  to             cost',12x
    &,'value    ance     ')
1037 FORMAT(1H ,'(Yr)          ($)      ($)      (1+r)  ($)     ($)     (
    &$)      ($)       ($)      ($)        ($)      ($)')
1038 FORMAT(1H,  102('_'))
     DO 1030 IIII =1,ID
     READ(7,1021) WEEKNO,PDAYS,CPDAYN,TINSCY,PINSCY,
    &    TPP,PPP,TSALV,PSALV,X(I),XXX,Z,TREPC,TPREPC,
    &    PREPC,TPPANC,PPANC,TACF,PACF,TLCOST,OPCOST,
    &    TSHTCY,PSHCTY,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
    &    TNPMV,PNPMV,TBC,PBC,SUM,SUM11,SUM51,SUM52,SUM1,SUM22,
    &    SUM61,SUM62
1021 FORMAT(1H , 3(I6),6(F10.2),3(F8.3),7(F11.2),2(F12.2),2(F12.2),
    &    10(F10.2),8(F10.2))
     WRITE(LURT,1039) ILIFE,BODIES(IIII),PPP,PMORTV,FL,SUM1,SUM22,
    &          PSALV,PNPMV,SUM61,SUM62,PBC,PPANC
1039 FORMAT(1H , I3,I5,F11.1,F9.1,F8.3,F7.1,F7.1,F8.1,F8.1,F8.1,F9.1,
    &    F10.1,F8.1)
1030 CONTINUE
     WRITE(LURT,1022)
1022 FORMAT(1H ,   102('-'))
c
```

APPENDIX 5 cont'd

10.3.2 TRACTOR AND CULTIVATOR COSTS

```
c
   IF (NIOORS.EQ.0) THEN
      I = 1
      CSP = 0
      CFW = 0
      CNF = 0
      CWIDTH = 0
      ACSP = 0
      ACWR = 0
      CHOURS = 0
      FTCH = 0
      CPP = 0
      CSALV = 0
      CAAP = 0
      CPAGE = 0
      CAAS = 0
      CREPC = 0
      CPANC = 0
      CACF = 0
      TCANC = 0
      CULCT(I) = 0
      CULFDN = 0
      CWEEKN = 0
      PCWEEK = 0
      CPDAYS = 0
      CULSDN = 0
      CFUCT = 0
      CLCOST= 0
   END IF
   IF (NIOORS.EQ.0) GOTO 616
c
c
c  Initialise variables.
c
   CNF = MINCNF
   CALL MSWDD
c
c  Assign cultivator for this run.
c
   I = 1
   WRITE(LURT,2011)
   WRITE(LURT,2012)
   WRITE(LURT,2013)
   WRITE(LURT,2014)
   WRITE(LURT,2015)
   WRITE(LURT,2016)
   WRITE(LURT,2017)
   WRITE(LURT,2018)
2011 FORMAT(1H0,'Table 8.7  Summary of cultivator output costing
   & rotine.    ')
2012 FORMAT(1H0, 104('_'))
2013 FORMAT(1H ,'Sale No. Mach Purchase Mortgage  Ratio   Sum   Sum   S
   &alvage  Net   Sum   Sum   Balancing Present')
2014 FORMAT(1H ,'age of ine price  value    of   repair insur-',
   &2x,'value  present  capital interest   charge   annual')
```

APPENDIX 5 cont'd

```
 2015 FORMAT(1H ,'     tin- width                           (1+g)  cost   ance',1
     &0x,'mortgage  allow-  charge                       cost')
 2016 FORMAT(1H ,'      es                                   to           cost',1
     &2x,'value     ance    ')
 2017 FORMAT(1H ,'(Yr)(/m)  (m)    ($)      ($)          (1+r)    ($)    ($)',4x
     &,'($)       ($)      ($)       ($)          ($)')
 2018 FORMAT(1h ,    104('_'))
c
      J6 = 0
      DO 261 J5 = 1,NIOORS
c     Read cultivator data.
c
      IOOREC = IOOR(J5)
      READ(LUDA8'IOOREC) CNF,MINCFW,MAXCFW,INCCFW,
     &                       CDEPTH,MINCSP,MAXCSP,INCCSP,CAAP,CPAGE,CAAS
c
      DO 262 JKP = 1,ID
c     Assign cultivator speed, furrow width and number of furrows.
c
      CSP1 = MINCSP*10.0
      CSP2 = MAXCSP*10.0
      CSP3 = INCCSP*10.0
c
      CFW1 = MINCFW*10.0
      CFW2 = MAXCFW*10.0
      CFW3 = INCCFW*10.0
c
      DO 314 MNJ1 = CSP1,CSP2,CSP3
      CSP = MNJ1/10.0
c
      DO 315 MNJ2 = CFW1,CFW2,CFW3
      CFW = MNJ2/10.0
      CWIDTH = CFW
      J6 = J6 + 1
      NCULC = CNF*CWIDTH
c
c     Calculate cultivator speed and work rate.
c     Units: km/h; ha/h.
c
      ACSP = CSP*(1-(TSLIP(J6)/100.0))
      ACWR = CWIDTH*(ACSP/10.0)*(FE/100.0)
c
c     Calculate cultivator hours used.
c     Units: hours.
c
      CHOURS = AREA/ACWR
c
c     Calculate proportion of annual tractor use in tillage.
c     Units: none.
c
      FTTH(J6) = (PHOURS(J6)+CHOURS)/TTUSEH
c
c     Calculate annual tractor use in tillage.
c     Units: hours.
c
      TTILLH(J6) = FTTH(J6)*TTUSEH
c
c     Calculate repair cost as a percentage of annual use.
c     _________ tractor tillage repair cost.
c     --------- tractor tillage annual cost.
```

APPENDIX 5 cont'd

```
c     Units: %, and currency units.
c
      XX = X(J6)*FTTH(J6)

      TTREPC = TPRCC(J6)*(TTILLH(J6)/TTUSEH)
      TTPANC = TPANC(J6)*(TTILLH(J6)/TTUSEH)
c
c     Calculate proportion of tractor hours allocated to cultivation.
c     Units: none.
c
      FTCH = CHOURS/TTUSEH
c
c     Calculate cultivator purchase price.
c     Units: currency units.
c
      CPP = -396.22+353.94*CWIDTH+30.80*NCULC
c
c     Calculate cultivator resale value after "CAAS" years used.
c     Units: currency units.
c
      K5 = CAAS-CAAP
      CSALV = 60.0*(0.885**K5)*(CPP/100.0)*((1+INFR)**K5)
c
c     Calculate cultivator repair cost.
c     Units: currency units.
c
      N4 = CPAGE
      CREPC=0.037*(((N4*AREA/1000.0)**1.4)-(((N4-1)*
     &  AREA/1000.0)**1.4))*(CPP*
     &    ((1+INFR)**N4))
c     Calculate cultivator annual capital allowance value.
c     -------- cultivator mortgage value.
c     -------- cultivator actual interest charge.
c     -------- cultivator net present mortgage value.
c     Units: currency unit.
c
      CCAV = PPP*(0.25*(0.75**(N4-1)))
      CMORTV = CPP*((1+INTR)**K5)*INTR/(((1+INTR)**K5)-1)
      CAINTC =(CPP*(((1+INTR)**K5)-((1+INTR)**(N4-1)))*INTR)/
     &     (((1+INTR)**K5)-1)
      CNPMV=CPP*(INTR/INVR)*(((1+INTR)**K5)/((1+INVR)**
     &          K5))*((((1+INVR)**K5)-1)/(((1+INTR)**K5)-1))
c
c     Calculate (SUM5) cult. accumulated repair hours, % of repair
c                      cost of purchase price.
c     --------- (sum71) accumulated annual capital allowance value.
c     --------- (CBC) cultivator final balancing charge.
c     --------- (CRSALV) resale value of cultivator for each year of
c                        ownership.
c     --------- (CINSCY) cultivator insurance for each year of ownership.
c     Calculate (CPANC) cultivator present annual cost.
c
c     Units: currency units.
c
      SUM5 = 0
      SUM31 = 0
      SUM32 = 0
      SUM33 = 0
      SUM70 = 0
      SUM71= 0
```

APPENDIX 5 cont'd

```
      SUM72 = 0
      DO 263 K6 =1,K5
      SUM5 = SUM5+((0.037*(((K6*AREA/1000.0)**1.4)-(((K6-1)*
     &      AREA/1000.0)**1.4)))*CPP*(FL**K6))
      SUM70 = SUM70+((0.25*(0.75**(K6-1)))*CPP)
      SUM71 = SUM71+((0.25*(0.75**(K6-1)))*CPP/((1+INVR)**K6))
      SUM72 = SUM72+((CPP*(((1+INTR)**K5)-((1+INTR)**(K6-1)))*
     &      INTR)/(((1+INTR)**K5)-1))/((1+INVR)**K6))
      CRSALV(K6) = 60.0*(0.885**(K6-1))*(CPP/100.0)
      IF (CRSALV(K6).LE.1000.0)  CINP(K6)=25.0
      IF (CRSALV(K6).GT.1000.0.AND.CRSALV(K6).LE.5000.0)  CINP(K6)=25.0+
     &                                   (1.2*((CRSALV(K6)-1000.0)/100.0))
      IF (CRSALV(K6).GT.5000.0.AND.CRSALV(K6).LE.15000.0) CINP(K6)=25.0+
     &   (1.2*((5000.0-1000.0)/100.0))+(0.95*((CRSALV(K6)-5000.0)/100.0))
      IF (CRSALV(K6).GT.15000.0.AND.CRSALV(K6).LE.40000.0) CINP(K6)=25.0
     &   +(1.2*((5000.0-1000.0)/100.0))+(0.95*((15000.0-5000.0)/100.0))+
     &                                   (0.85*((CRSALV(K6)-15000.0)/100.0))
      SUM31 = SUM31+(CINP(K6)*(FL**K6))
      SUM32 = SUM32+(CINP(K6)*((1+INFR)**K6))
      IF ((K6-1).EQ.0)  SUM33 = 0
      IF ((K6-1).NE.0)  SUM33 = SUM33+(CINP(K6-1)*((1+INFR)**(K6-1)))
  263 CONTINUE
      CBC = (SUM70+CSALV-CPP)/((1+INVR)**K5)
      CPANC=(CNPMV-(TAXR*(SUM71+SUM72))+(TAXR*CBC)+((1-TAXR)*
     &      (SUM5+SUM31))-(CSALV/((1+INVR)**K5)))*(FL-1)/(FL*((FL**
     &      K5)-1))
      CINSCY = SUM32-SUM33
c
c     Calculate tractor present annual cost due to cultivation.
c     Units: currency units.
c
      TCANC = TPANC(J6)*(CHOURS/TTUSEH)
      TCREPC(I) = TPRCC(I)*(CHOURS/TTUSEH)
c
c     Calculate cultivator shelter cost.
c     Units: currency unit.
c
      CSHTCY = 0.010*CPP
c
c     Calculate cultivator annual cash flow.
c     Units: currency units.
c
      CACF = (CPP-CSALV)*(FL**(K5-1))*(FL-1)/((FL**K5)-1)
c
c     Calculate tractor fuel cost for cultivation.
c     Units: currency units.
c
      CFUCT=(2.64*PTORA(J6)+3.91-0.2*((738*PTORA(J6)+173)**0.5))*
     &      PTOP(J6)*CHOURS*FCOSTL
c
c     Calculate cultivation labour cost.
c     Units: currency units.
c
      CLCOST = CHOURS*LCOSTH
c
c     Test cultivation days against workability days.
c     Units: days.
c
      CULSDN = ((PWWN(J6)+1)*7)-6
      CULTIV = CHOURS/8
```

APPENDIX 5 cont'd

```
      CULFDN = (CULSDN-1) + CULTIV
      CULWD = 0
      CWWN(J6) = PWWN(J6)+ 1
      M5 = CWWN(J6)
      M6 = M5 + 52
      DO 264 J7 = M5,M6
      MMM = J7
      IF (MMM.GT.52) MMM = MMM-52
      CULWD = CULWD + WDAYS(MMM)
      IF (CULWD.GE.CULTIV) GOTO 265
 264  CONTINUE
 265  CWEEKN = MMM
      PCWEEK = CULWD
      RCDS(I)= CULTIV
      CPDAYS = (((CWEEKN+1)-CWWN(J6))*7)-PCWEEK
      CWDAYS = RCDS(I)-(PCWEEK-WDAYS(MMM))
      FCULDN(I)=(CULSDN-1)+((CWEEKN-CWWN(J6))*7)+CWDAYS+((CWDAYS/
     &          WDAYS(MMM))*(7-WDAYS(MMM)))
c
c     Calculate total cultivation operation cost.
c
c     Units: currency units.
c
      CTCOST = CPANC + CFUCT + CLCOST + TCANC + CINSCY + CSHTCY
     &         + (FTORC(I)*CHOURS/TTUSEH)
      CULCT(I) = CTCOST
c
      WRITE(LURT,2019) CAAS,CNF,CWIDTH,CPP,CMORTV,FL,SUM5,SUM31,CSALV,
     &                 CNPMV,SUM71,SUM72,CBC,CPANC
 2019 FORMAT(1H ,I2,I5,F6.1,F8.1,F9.1,F8.3,F7.1,F7.1,F8.1,F8.1,F8.1,
     &       F9.1,F10.1,F8.1)
c
c     Write cultivation technical and financial results in the file attached
c     to logical unit LUCALC
c
      WRITE(8,266) CPP,CSALV,CREPC,CPANC,CFUCT,CLCOST,CACF,TCANC,
     &ACSP,CHOURS,ACWR,CWIDTH,CINSCY,FTCH,NCULC,CULSDN,
     &       CULFDN,CWEEKN,PCWEEK,CPDAYS,CSHTCY,CCAV,CMORTV,CAINTC,
     &       CNPMV,CBC,XX,TTREPC,TTPANC
  266 FORMAT(1H , 8(F10.2),6(F10.3),6(I6),F10.2,8(F10.2))
c
      I = I + 1
      IF (J6.GE.ID) GOTO 4044
  315 CONTINUE
  314 CONTINUE
  262 CONTINUE
  261 CONTINUE
  616 CONTINUE
 4044 CONTINUE
      WRITE(LURT,2065)
 2065 FORMAT(1H ,  104('-'))
c
```

10.3.3 TRACTOR AND DRILL COSTS

```
c      Initialise variables.
c
       DNR = MINDNR
```

APPENDIX 5 cont'd

```
      J4 = 1
c
      WRITE(LURT,2051)
      WRITE(LURT,2052)
      WRITE(LURT,2053)
      WRITE(LURT,2054)
      WRITE(LURT,2055)
      WRITE(LURT,2056)
      WRITE(LURT,2057)
      WRITE(LURT,2058)
 2051 FORMAT(1H0,'Table 8.8  Summary of drill output costing routine.')
 2052 FORMAT(1H0,   104('_'))
 2053 FORMAT(1H ,'Sale No. Mach Purchase Mortgage  Ratio    Sum    Sum',3x
     &,'Salvage   Net     Sum     Sum     Balancing Present')
 2054 FORMAT(1H ,'age  of  ine   price    value     of   repair insur-',
     &2x,'value  present  capital interest   charge   annual')
 2055 FORMAT(1H ,'      coul width                      (1+g)  cost    ance',1
     &0x,'mortgage  allow-  charge                 cost')
 2056 FORMAT(1H ,'      ters                              to              cost',1
     &2x,'value     ance      ')
 2057 FORMAT(1H ,'(Yr)      (m)     ($)      ($)      (1+r)   ($)     ($)',4x
     &,'($)      ($)     ($)     ($)       ($)      ($)')
 2058 FORMAT(1H ,    104('_'))
c
c     Assign direct drill for this run.
      JJ2 = 0
      DO 222 KK =1,NF01RS
c     Read direct drill data.
c
      F01REC = F01R(KK)
      READ(LUDA7'F01REC) MINDNR,MAXDNR,INCDNR,MINDW,MAXDW,INCDW,DDEPTH,
     &                   MINDSP,MAXDSP,INCDSP,DAAP,DPAGE,DAAS
c
c     Assign work day data
      DO 119 JKR = 1,ID
c
      CALL MSWDD
c     Assign direct drill width and speed.
c
      DSP1 = MINDSP*10.0
      DSP2 = MAXDSP*10.0
      DSP3 = INCDSP*10.0

      DO 322 MNK1 = DSP1,DSP2,DSP3
      DSP = MNK1/10.0
      DO 323 MNK2 = MINDNR,MAXDNR,INCDNR
      DNR = MNK2
      JJ2 = JJ2 + 1
      DRW = DRW + INCDW
      IF (DRW.GT.MAXDW) DRW = DRW-INCDW
      IF(DRW.LT.MINDW) DRW = DRW+INCDW
c
      DRWW = DNR*DRW
c
c     Calculate actual direct drill speed and work rate.
c     Units: km/h; ha/h.
c
      ADSP = DSP*(1-(TSLIP(JJ2)/100.0))
      ADR  = DRWW*(ADSP/10.0)*(FE/100.0)
c
```

APPENDIX 5 cont'd

```
c     Calculate drill hours.
c     Units: hours.
c
      DHOURS = AREA/ADR
c
c     Calculate proportion of tractor hours allocated to drilling.
c     Units: none
c
      FTDH = DHOURS/TTUSEH
c
c     Calculate drill purchase price.
c     Units: currency units.
c
      DPP =-5778.25+156.36*DNR+35589.21*DRW
c
c     Calculate drill resale value after DAAS years.
c     Units: currency units.
c
      JSSS = DAAS-DAAP
      DSALV = 60.0*(0.885**JSSS)*(DPP/100.0)*((1+INFR)**JSSS)
c
c     Calculate drill repair cost.
c     units: currency units.
c
      N2 = DPAGE
      DREPC=(0.089*(((N2*AREA/1000.0)**2.626)-(((N2-1)*
     &   AREA/1000.0)**2.626)))*(DPP*
     &     ((1+INFR)**N2))
c
c     Calculate :  (DCAV) Drill capital allowance value.
c                  (DMORTV)  Drill mortgage value.
c                  (DAINTC)  drill actual charge.
c                  (DNPMV)   Drill net present mortagage value.
c     Units: currency unit.
c
      DCAV = 0.25*(0.75**(N2-1))*DPP
      DMORTV=DPP*((1+INTR)**JSSS)*INTR/(((1+INTR)**JSSS)-1)
      DAINTC=(DPP*(((1+INTR)**JSSS)-((1+INTR)**(N2-1)))*INTR)/
     &     ((((1+INTR)**JSSS)-1)
      DNPMV=DPP*(INTR/INVR)*(((1+INTR)**JSSS)/((1+INVR)**
     &    JSSS))*((((1+INVR)**JSSS)-1)/((((1+INTR)**JSSS)-1))
c
c     Calculate accumulated drill repair hours, % of repair purchase
c                  price.
c     Accumulated annual capital  allowance value.
c     ----------- drill final balancing charge.
c     ----------- accumulated actual interest charge.
c     ----------- resale value of drill for each year of ownership.
c     ----------- drill insurance for each year of ownership.
c     Calculate direct drill present annual cost.
c
c     Units: currency units.
      SUM3=0
      SUM41 = 0
      SUM42 = 0
      SUM43 = 0
      SUM80 = 0
      SUM81 = 0
      SUM82 = 0
      DO 405 K3 = 1,JSSS
```

APPENDIX 5 cont'd

```
      SUM3=SUM3+((0.089*(((K3*AREA/1000.0)**2.626)-(((K3-1)*
     &      AREA/1000.0)**2.626)))*DPP*(FL**K3))
      SUM80 = SUM80+((0.25*(0.75**(K3-1)))*DPP)
      SUM81 = SUM81+((0.25*(0.75**(K3-1)))*DPP/((1+INVR)**K3))
      SUM82 = SUM82+((DPP*((((1+INTR)**JSSS)-((1+INTR)**(K3-1)))*
     &      INTR)/(((1+INTR)**JSSS)-1))/((1+INVR)**K3))
      DRSALV(K3) = 60.0*(0.885**(K3-1))*(DPP/100.0)
      IF (DRSALV(K3).LE.1000.0)  DINP(K3)=25.0
      IF (DRSALV(K3).GT.1000.0.AND.DRSALV(K3).LE.5000.0)  DINP(K3)=25.0+
     &                                  (1.2*((DRSALV(K3)-1000.0)/100.0))
      IF (DRSALV(K3).GT.5000.0.AND.DRSALV(K3).LE.15000.0) DINP(K3)=25.0+
     &  (1.2*((5000.0-1000.0)/100.0))+(0.95*((DRSALV(K3)-5000.0)/100.0))
      IF (DRSALV(K3).GT.15000.0.AND.DRSALV(K3).LE.40000.0) DINP(K3)=25.0
     &   +(1.2*((5000.0-1000.0)/100.0))+(0.95*((15000.0-5000.0)/100.0))+
     &                                 (0.85*((DRSALV(K3)-15000.0)/100.0))
      SUM41 = SUM41+(DINP(K3)*(FL**K3))
      SUM42 = SUM42+(DINP(K3)*((1+INFR)**K3))
      IF ((K3-1).EQ.0)  SUM43 = 0
      IF ((K3-1).NE.0)  SUM43 = SUM43+(DINP(K3-1)*((1+INFR)**(K3-1)))
  405 CONTINUE
      DBC = (SUM80+DSALV-DPP)/((1+INVR)**JSSS)
      DPANC = (DNPMV-(TAXR*(SUM81+SUM82))+(DBC*TAXR)+((1-TAXR)*
     &      (SUM3+SUM41))-(DSALV/((1+INVR)**JSSS)))*(FL-1)/(FL*
     &      ((FL**JSSS)-1))
      DINSCY = SUM42-SUM43
C
C     Calculate tractor present annual cost due to drilling
C     Units: currency units.
C
      TDANC = TPANC(JJ2)*(DHOURS/TTUSEH)
      TDREPC(JJ2) = TPRCC(JJ2)*(DHOURS/TTUSEH)
C
C     Calculate drill shelter costs.
C     Units: currency unit.
C
      DSHTCY = 0.010*DPP
C
C     Calculate direct drill annual cash flow.
C     Units: currency units.
C
      JSSS = DAAS
      DACF = (DPP-DSALV)*(FL**(JSSS-1))*(FL-1)/
     &           ((FL**JSSS)-1)
C
C     Calculate tractor fuel cost for drilling.
C     Units: currency units.
C
      DFUCT=(2.64*PTORA(JJ2)+3.91-0.2*((738*PTORA(JJ2)+173)**0.5))*
     &    PTOP(JJ2)*DHOURS*FCOSTL
C
C     Calculate labour cost of drilling operation.
C     Units: currency units.
C
      DLCOST = DHOURS*LCOSTH
C
C     Test drilling work days aganist soil workablity days.
C
      SSDN = OPTDN - (DHOURS/16)
      IF ((PWWN(JJ2)+1).LT.(SSDN/7)) SWWN(JJ2) = SSDN/7
      IF ((PWWN(JJ2)+1).GE.(SSDN/7)) SWWN(JJ2) = PWWN(JJ2)+1
```

APPENDIX 5 cont'd

```
      SWWN(JJ2) = SSDN/7.0
C
      MKJ = (SWWN(JJ2)*7)-6
      MK  = SSDN - MKJ
      IF (MKJ.GE.SSDN)  GOTO 3601
      IF (MKJ.LT.SSDN.AND.MK.LT.7 ) GOTO 3602
      IF (MKJ.LT.SSDN.AND.MK.LT.14) GOTO 3603
      IF (MKJ.LT.SSDN.AND.MK.LT.21) GOTO 3604
      IF (MKJ.LT.SSDN.AND.MK.LT.28) GOTO 3605
      IF (MKJ.LT.SSDN.AND.MK.LT.35) GOTO 3606
      IF (MKJ.LT.SSDN.AND.MK.LT.42) GOTO 3607
C
 3601 SDAYN = MKJ
      GOTO 3609
 3602 SDAYN = MKJ
      GOTO 3609
 3603 SDAYN = MKJ + 7
      GOTO 3609
 3604 SDAYN = MKJ + 14
      GOTO 3609
 3605 SDAYN = MKJ + 21
      GOTO 3609
 3606 SDAYN = MKJ + 28
      GOTO 3609
 3607 SDAYN = MKJ + 35
 3609 CONTINUE
      OPDAYS = DHOURS/8
      CDAYN = (SDAYN-1) + OPDAYS
      ADWDN = 0
      SSWNO = (SDAYN+6)/7
      J2 = SSWNO
      K2 = J2+52
      DO 430 LL = J2,K2
      LLL = LL
      IF (LLL.GT.52) LLL = LLL-52
      ADWDN = ADWDN + WDAYS(LLL)
      IF (ADWDN.GE.OPDAYS) GOTO 440
  430 CONTINUE
  440 SWEEKN = LLL
      DAWDAY(JJ2) = ADWDN
      RDDS(JJ2) = OPDAYS
      SPDAYS = (((SWEEKN+1)-SSWNO)*7)-ADWDN
      CDDWS  = RDDS(JJ2)-(DAWDAY(JJ2)-WDAYS(LLL))
      PCDAYN = (SDAYN-1)+((SWEEKN-SSWNO)*7)+CDDWS+((CDDWS/WDAYS(LLL))*
     &         (7-WDAYS(LLL)))
      IF (SWEEKN.LE.(CDAYN/7))  SPWEEK = 0
      IF (SWEEKN.GT.(CDAYN/7))  SPWEEK = SWEEKN-(CDAYN/7)
C
C     Calculate loss of crop yield.
C     Units: currency units.
C
      IF (SDAYN.GE.OPTDN)  ELOSS = 0
      IF (SDAYN.LT.OPTDN)  ELOSS = CPA*((OPTDN-SDAYN)**2)/3.0
      IF (PCDAYN.LE.OPTDN) DLOSS = 0
      IF (PCDAYN.GT.OPTDN) DLOSS = CPB*((PCDAYN-OPTDN)**2)/3.0
C
      IF (ELOSS.EQ.0)  AVRLOS = DLOSS
      IF (DLOSS.EQ.0)  AVRLOS = ELOSS
      IF (ELOSS.NE.0.AND.DLOSS.NE.0) AVRLOS= ELOSS+DLOSS
C
```

APPENDIX 5 cont'd

```
      AVERY= MAXY*(1-(AVRLOS/100.0))
C
C     Calculate value of crop yield loss.
C     Units: currency units.
C
      YLCASH = (MAXY-AVERY)*CROPVT*AREA
      YLOSSC(JJ2) = YLCASH
C     Calculate total tractor-drill combination cost
C     Units: currency units.
C
      DRCOST(JJ2) =  DPANC + DFUCT + TDANC + DLCOST + DINSCY
     &          + DSHTCY + (FTORC(JJ2)*DHOURS/TTUSEH)
C
C     Write drill technical and financial results in the file attached
C     to logical unit LUCALC.
C
      WRITE(6,37) SSWNO,SWEEKN,SDAYN,PCDAYN,SPDAYS,DNR,CDAYN,
     &            DPP,DSALV,DREPC,DPANC,DACF,DLCOST,DFUCT,ELOSS,DINSCY,
     &           DLOSS,AVERY,AVRLOS,ADR,DRWW,DRW,ADSP,DHOURS,TDANC,FTDH,
     &            DSHTCY,DCAV,DMORTV,DAINTC,DNPMV,DBC
   37 FORMAT(1H , 7(I6),7(F10.2),4(F9.4),F9.4,4(F8.3),2(F8.2),F5.3,
     &           F8.2,5(F10.2))
C
      WRITE(LURT,2059) DAAS,DNR,DRWW,DPP,DMORTV,FL,SUM3,SUM41,DSALV,
     &                 DNPMV,SUM81,SUM82,DBC,DPANC
 2059 FORMAT(1H ,I2,I5,F5.1,F9.1,F9.1,F8.3,F7.1,F7.1,F8.1,F8.1,F8.1,
     &           F9.1,F10.1,F8.1)
C
      J4 = J4 + 1
      IF (JJ2.GE.ID) GOTO 5055
  323 CONTINUE
  322 CONTINUE
  119 CONTINUE
  222 CONTINUE
 5055 CONTINUE
      WRITE(LURT,2061)
 2061 FORMAT(1H ,   104('_'))
C
C     Calculate total operation cost (Ploughing ,Cultivation and drilling)
C     Units: currency units.
C
      DO 1002 KK = 1,ID
      TOTALS(KK) = YLCCOT(KK) + YLOSSC(KK) + DRCOST(KK) + CULCT(KK)
 1002 CONTINUE
C
      RETURN
C
      END
```

APPENDIX 5 cont'd

11-A CALLING REPORT

```
C
C     Report 1.
C
      IF (REPORT(1).EQ.YES) CALL MSR1
C
C     Report 2.
C
      IF (REPORT(2).EQ.YES) CALL MSR2
C
C     Report 3.
C
      IF (REPORT(3).EQ.YES) CALL MSR3
C
C     Report 4.
C
      IF (REPORT(4).EQ.YES) CALL MSR4
C
C     Report 5.
C
      IF (REPORT(5).EQ.YES) CALL MSR5
C
C     Report 6.
C
      IF (REPORT(6).EQ.YES) CALL MSR6
C
C     Report 7.
C
      IF (REPORT(7).EQ.YES) CALL MSR7
C
C     Report 8.
C
      IF (REPORT(8).EQ.YES) CALL MSR8
C
C     Report 9.
C
      IF (REPORT(9).EQ.YES) CALL MSR9
C
C     Report 10.
C
      IF (REPORT(10).EQ.YES) CALL MSR10
C
C     Report 11.
C
      IF (REPORT(11).EQ.YES) CALL MSR11
C
C     Report 12.
C
      IF(REPORT(12).EQ.YES) CALL MSR12
C
      RETURN
C
      END
```

APPENDIX 5 cont'd

11-B SEQUENTIAL REPORTS

```
c
c     Open data file.
c
      OPEN(UNIT=LUDA,NAME='MSRT.DAT',TYPE='UNKNOWN',DISPOSE='SAVE',
     &     ACCESS='DIRECT',CARRIAGECONTROL='NONE',FORM='UNFORMATTED',
     &     RECORDSIZE=RTRL,ASSOCIATEVARIABLE=NDAR,MAXREC=MAXRT)
c
c     Read data from file.
c
      RTREC = 1
      READ(LUDA'RTREC) DATASY,REPORT
c
      WRITE(LUTT,10)
      WRITE(LUTT,20)
   10 FORMAT(1H0,'   REPORT                      ')
   20 FORMAT(1H ,'   ------------------------')
c
c     Data summary.
c     Units: none.
c
   30 CALL LINE(LUTT)
      WRITE(LUTT,40)
   40 FORMAT(1H ,'   data summary       (Y/N)',$)
      RARRAY(1)=YES
      RARRAY(2)=NO
      CALL PGA(LUTT,LUTT,5,DATASY,4,11,RARRAY,2,ERROR)
      IF (ERROR.NE.0) GOTO 30
c
      CALL LINE(LUTT)
      DO 70 I=1,RPORTS
c     Report number.
c     Units: none.
c
   50 WRITE(LUTT,60) I
   60 FORMAT(1H ,'   report ',I2,7X,'   (Y/N)',$)
      CALL PGA(LUTT,LUTT,5,REPORT(I),4,11,RARRAY,2,ERROR)
      IF (ERROR.NE.0) GOTO 50
   70 CONTINUE
c
c     Write data to file.
c
      WRITE(LUDA'RTREC) DATASY,REPORT
c
c     Close data file.
c
      CLOSE(UNIT=LUDA)
C
      RETURN
c
      END
```

APPENDIX 5 cont'd

```
      11.1  REPORT 1 (input data)
c     ___________________________
c
      WRITE(LURT,10)  TYPE
      WRITE(LURT,20)
      WRITE(LURT,30)
      WRITE(LURT,40)
      WRITE(LURT,50) SSNAME
      WRITE(LURT,60) FC
      WRITE(LURT,70) MCWW
      WRITE(LURT,80) SBD
      WRITE(LURT,90) WABY
      WRITE(LURT,100) SKC
      WRITE(LURT,110) SKF
      WRITE(LURT,120) SCR
c
      WRITE(LURT,130)
      WRITE(LURT,140)
      WRITE(LURT,150) PLSDAY
      WRITE(LURT,160) PLCDAY
      WRITE(LURT,170) SWNO
      WRITE(LURT,180) CWNO
      WRITE(LURT,190) FE
      WRITE(LURT,200) PROB
      WRITE(LURT,210) AREA
      WRITE(LURT,220) MINPS
      WRITE(LURT,230) MAXPS
      WRITE(LURT,240) INCPS
      WRITE(LURT,250) MINPCD
      WRITE(LURT,260) MAXPCD
      WRITE(LURT,270) INCPCD
c
      WRITE(LURT,280)
      WRITE(LURT,290)
      WRITE(LURT,300) CNF
      WRITE(LURT,310) MINCFW
      WRITE(LURT,320) MAXCFW
      WRITE(LURT,330) INCCFW
      WRITE(LURT,340) MINCSP
      WRITE(LURT,350) MAXCSP
      WRITE(LURT,360) INCCSP
      WRITE(LURT,370) CDEPTH
      WRITE(LURT,380) CAAP
      WRITE(LURT,390) CPAGE
      WRITE(LURT,400) CAAS
c
      WRITE(LURT,410)
      WRITE(LURT,420)
      WRITE(LURT,430) MINDNR
      WRITE(LURT,440) MAXDNR
      WRITE(LURT,450) INCDNR
      WRITE(LURT,460) MINDW
      WRITE(LURT,470) MAXDW
      WRITE(LURT,480) INCDW
      WRITE(LURT,490) DDEPTH
      WRITE(LURT,500) MINDSP
```

APPENDIX 5 cont'd

```
      WRITE(LURT,510) MAXDSP
      WRITE(LURT,520) INCDSP
      WRITE(LURT,530) DAAP
      WRITE(LURT,540) DPAGE
      WRITE(LURT,550) DAAS
c
      WRITE(LURT,560)
      WRITE(LURT,570)
      WRITE(LURT,580) INTR
      WRITE(LURT,590) INVR
      WRITE(LURT,600) TAXR
      WRITE(LURT,610) INFR
      WRITE(LURT,620) FCOSTL
      WRITE(LURT,630) LCOSTH
      WRITE(LURT,640) TSHCY
      WRITE(LURT,650) IMSHCY
      WRITE(LURT,660) TTAXCY
      WRITE(LURT,670) CROPNE
      WRITE(LURT,680) CROPVT
      WRITE(LURT,690) OPTDN
      WRITE(LURT,700) MAXY
      WRITE(LURT,710) CPA
      WRITE(LURT,720) CPB
c
c
   10 FORMAT(1H0,' REPORT 1:  Input data summary     ',4(A4),'   ')
   20 FORMAT(1H ,' ------------------------------')
c
   30 FORMAT(1H0,'Soil specifications:          ')
   40 FORMAT(1H ,'--------------------          ')
   50 FORMAT(1H ,'   soil name                   ',4(A4))
   60 FORMAT(1H ,'   field capacity         (mm)',F9.2)
   70 FORMAT(1H ,'   moisture content    (%w/w)',F9.2)
   80 FORMAT(1H ,'   dry bulk density (kN/m3)',F9.2)
   90 FORMAT(1H ,'   soil workability        (%)',I9)
  100 FORMAT(1H ,'   cohesive parameter         ',F9.5)
  110 FORMAT(1H ,'   frictional parameter       ',F9.5)
  120 FORMAT(1H ,'   clay ratio                 ',F9.4)
c
  130 FORMAT(1H0,'Operating conditions:        ')
  140 FORMAT(1H ,'---------------------        ')
  150 FORMAT(1H ,'   plough start day no       ',I9)
  160 FORMAT(1H ,'   expect finish plough day',I9)
  170 FORMAT(1H ,'   start plouh week no       ',I9)
  180 FORMAT(1H ,'   expect finish week no     ',I9)
  190 FORMAT(1H ,'   field efficiency        (%)',I9)
  200 FORMAT(1H ,'   probability level       (%)',I9)
  210 FORMAT(1H ,'   area                   (ha)',F9.2)
  220 FORMAT(1H ,'   min. plough speed (km/h)',F9.2)
  230 FORMAT(1H ,'   max. plough speed (km/h)',F9.2)
  240 FORMAT(1H ,'   inc. plough speed (km/h)',F9.2)
  250 FORMAT(1H ,'   min. plough cut depth(m)',F9.2)
  260 FORMAT(1H ,'   max. plough cut depth(m)',F9.2)
  270 FORMAT(1H ,'   inc. plough cut depth(m)',F9.2)
c
  280 FORMAT(1H0,'Cultivator specification:')
  290 FORMAT(1H ,'-------------------------')
  300 FORMAT(1H ,'   no of (blades/tines)/m ',I9)
  310 FORMAT(1H ,'   min. cult width        (m)',F9.2)
  320 FORMAT(1H ,'   max. cult. width       (m)',F9.2)
```

APPENDIX 5 cont'd

```
 330 FORMAT(1H ,'  inc. cult. width    (m)',F9.2)
 340 FORMAT(1H ,'  min. cult. speed (km/h)',F9.2)
 350 FORMAT(1H ,'  max. cult. speed (km/h)',F9.2)
 360 FORMAT(1H ,'  inc. cult. speed (km/h)',F9.2)
 370 FORMAT(1H ,'  cultivation depth   (m)',F9.2)
 380 FORMAT(1H ,'  purchase age       (yr)',I9)
 390 FORMAT(1H ,'  present age        (yr)',I9)
 400 FORMAT(1H ,'  sale age           (yr)',I9)
c
 410 FORMAT(1H0,'Drill specifications:    ')
 420 FORMAT(1H ,'--------------------     ')
 430 FORMAT(1H ,'  min. no. of coulters    ',I9)
 440 FORMAT(1H ,'  max. no. of coulters    ',I9)
 450 FORMAT(1H ,'  inc. no. of coulters    ',I9)
 460 FORMAT(1H ,'  min. coulter space  (m)',F9.2)
 470 FORMAT(1H ,'  max. coulter space  (m)',F9.4)
 480 FORMAT(1H ,'  inc. coulter space  (m)',F9.4)
 490 FORMAT(1H ,'  drilling depth      (m)',F9.2)
 500 FORMAT(1H ,'  min. drill speed (km/h)',F9.2)
 510 FORMAT(1H ,'  max. drill speed (km/h)',F9.2)
 520 FORMAT(1H ,'  inc. drill speed (km/h)',F9.2)
 530 FORMAT(1H ,'  purchase age       (yr)',I9)
 540 FORMAT(1H ,'  present age        (yr)',I9)
 550 FORMAT(1H ,'  sale age           (yr)',I9)
c
 560 FORMAT(1H0,'Operational costs:        ')
 570 FORMAT(1H ,'-----------------         ')
 580 FORMAT(1H ,'  loan interest rate       ',F9.2)
 590 FORMAT(1H ,'  investement rate         ',F9.2)
 600 FORMAT(1H ,'  tax rate                 ',F9.2)
 610 FORMAT(1H ,'  inflation rate           ',F9.2)
 620 FORMAT(1H ,'  fuel cost            ($/l)',F9.2)
 630 FORMAT(1H ,'  labour cost          ($/h)',F9.2)
 640 FORMAT(1H ,'  tractor shelter rate     ',F9.2)
 650 FORMAT(1H ,'  implement shelter rate   ',F9.2)
 660 FORMAT(1H ,'  tractor road tax ($/yr)',F9.2)
 670 FORMAT(1H ,'  crop name                    ',4(A4))
 680 FORMAT(1H ,'  crop value           ($/t)',F9.2)
 690 FORMAT(1H ,'  optimum sowing day no. ',I9)
 700 FORMAT(1H ,'  max optimum yield(t/ha)',F9.2)
 710 FORMAT(1H ,'  early loss coefficient ',F9.5)
 720 FORMAT(1H ,'  late loss coefficient  ',F9.5)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

11.2 REPORT 2

```
c
      OPEN(UNIT=5,NAME='MSCALC5.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=9,NAME='MSCALC9.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
c
      WRITE(LURT,10) TYPE
      WRITE(LURT,20)
c
      WRITE(LURT,30)  TYPE
c
      WRITE(LURT,40)
c
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,70)
      WRITE(LURT,80)
      WRITE(LURT,90)
c
      WRITE(LURT,100)
c
   10 FORMAT(1H0,'  REPORT 2:     ',4(A4),'  ')
   20 FORMAT(1H ,'  -----------------------  ')
c
   30 FORMAT(1H0,'Table     Predicted performance parameters for option
     &al tyres for  ',4(A4),'  ')
c
   40 FORMAT(1H0,  80('-'))
c
   50 FORMAT(1H , 23x,'Tyre',16x,'Traction',13x,'Axle  Pres Mobil')
   60 FORMAT(1H ,'Power Tyre size',5x,'dimension',14x,'parameter',12x,
     &'load  sure  ity')
   70 FORMAT(1H , 16x,18('-'),2x,27('-'))
   80 FORMAT(1H , 17x,'b',4x,'h',4x,'D',4x,'d',3x,'CTmax',2x,'CT',4x,
     &'K',4x,'CRR',3x,'TE',4x,'W',4x,'P',4x)
   90 FORMAT(1H ,'(kW)',4x,'(in)',4x,'(m)',2x,'(m)',2x,'(m)',2x,'(m)',
     & 30x,'(kN)',x,'(kPa)',2x,'no.')
c
  100 FORMAT(1H , 80('-'))
c
      DO 200 II = 1,ID
c
      READ(5,1170) IDDD,PCD,PCW,SSW,CI,FWLD,WDLD,PTWT,PWT,TWT,
     &             WF,WR,FWW,RWW,FTSH,TRSH,FTDF,TRDF,FWD,TRD
 1170 FORMAT(1H , I4,4(F8.3),15(F10.3))
      READ(9,1155) FMN,WMN,FSLIP,RSLIP,CRRF,CRR,RRF,RRR,CTMAXF,
     &             CTMAX,CTF,CT,FK,RK,TMAXF,TMAXR,TMAX,TF1,TR2,
     &             TFR,TE,PD,TR,APS,APULL,TPULL,TRATIO,
     &             TPOWER
 1155 FORMAT(1H , 28(F10.4))
      WRITE(LURT,110) ENGINE(II),FTW,FRD,FWW,FTSH,FWD,FTDF,CTMAXF,CTF,
     &       FK,CRRF,TE,WF,FINFP,FMN,
     &       TRW,RMD,RWW,TRSH,TRD,TRDF,CTMAX,CT,RK,CRR,WR,TINFP,WMN
  110 FORMAT(1H ,I3,x,'F',x,F4.1,'-',F4.1,2(x,F4.2),2(x,F4.2),2(x,F5.3),
     &          x,F4.2,x,F5.3,2(x,F4.1),x,F5.1,x,F5.2,/,
```

APPENDIX 5 cont'd

```
     &            5x,'R',x,F4.1,'-',F4.1,2(x,F4.2),2(x,F4.2),2(x,F5.3),
     &            x,F4.2,x,F5.3,6x,F4.1,x,F5.1,x,F5.2)
c
  200 CONTINUE
c
      WRITE(LURT,119)
      WRITE(LURT,120)
      WRITE(LURT,130)
      WRITE(LURT,140)
  119 FORMAT(1H , 80('-'))
  120 FORMAT(1H0,'  Axle load = Dynamic axle laod,  ')
  130 FORMAT(1H ,'  F = Front wheel,  ')
  140 FORMAT(1H ,'  R = Rear wheel.  ')
c
      CLOSE(UNIT=5)
      CLOSE(UNIT=9)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd
11.3 REPORT 3

```
C
      OPEN(UNIT=5,NAME='MSCALC5.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=9,NAME='MSCALC9.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      WRITE(LURT,10)  TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30)
C
      WRITE(LURT,40)
C
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,70)
      WRITE(LURT,80)
      WRITE(LURT,90)
C
   10 FORMAT(1H0,'  REPORT 3:     ',4(A4),' ')
   20 FORMAT(1H ,'  ________________________')
C
   30 FORMAT(1H0,'Table 2b  Single 4-WD (equal) tractor-plough com
     &binations with implement work rate, ',/,'           maximum, actua
     &l and theoretical pull, and tractor power')
C
   40 FORMAT(1H0,  86('_'))
C
   50 FORMAT(1H ,'Ref',11x,'Plough',11x,'Dynamic axle load  Slip',4x,'Pu
     &ll',6x,'Draw',2x,'P.T.O Tractor')
   60 FORMAT(1H , 4x,25('-'),2x,17('-'),7x,11('-'),2x,'bar')
   70 FORMAT(1H ,'     Bod Width Depth Speed Work    Front    Rear
     &Actual Theor',2x,'power',x,'power  power')
   80 FORMAT(1H , 4x,'ies',19x,'rate',38x)
   90 FORMAT(1H ,'no.',6x,'(m)  (m) (km/h) (ha/h)  (kN)    (kN)      (%)
     & (kN) (kN)   (kW)    (kW)    (kW)')
C
      WRITE(LURT,100)
  100 FORMAT(1H , 86('_'))
C
      DO 200 I = 1,ID
C
      READ(5,1170) IDDD,PCD,PCW,SSW,CI,FWLD,WDLD,PTWT,PWT,TWT,
     &             WF,WR,FWW,RWW,FTSH,TRSH,FTDF,TRDF,FWD,TRD
 1170 FORMAT(1H , I4,4(F8.3),15(F10.3))
      READ(9,1155) FMN,WMN,FSLIP,RSLIP,CRRF,CRR,RRF,RRR,CTMAXF,
     &             CTMAX,CTF,CT,FK,RK,TMAXF,TMAXR,TMAX,TF1,TR2,
     &             TFR,TE,PD,TR,APS,APULL,TPULL,TRATIO,
     &            TPOWER
 1155 FORMAT(1H , 28(F10.4))
C
      WRITE(LURT,110) IDDD,BODIES(I),PCW,PCD,APS,PERHR(I),WF,WR,
     &                TSLIP(I),APULL,TPULL,DRBKW(I),PTOP(I),ENGINE(I)
  110 FORMAT(1H ,I4,I2,2X,F4.2,2X,F4.2,X,F5.2,2X,F4.2,3X,F5.2,2X,F5.2,
     &            3X,F5.2,X,2(F5.2,X),X,F5.2,X,F6.2,2X,I3)
  200 CONTINUE
C
      WRITE(LURT,120)
  120 FORMAT(1H , 86('-'))
C
      CLOSE(UNIT=5)
      CLOSE(UNIT=9)
C
```

APPENDIX 5 cont'd

11.4 REPORT 4

```
C
      OPEN(UNIT=6,NAME='MSCALC6.RES',TYPE='UNKNOWN',
     &      ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=8,NAME='MSCALC8.RES',TYPE='UNKNOWN',
     &      ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      REWIND (UNIT=6)
      REWIND (UNIT=8)
C
      WRITE(LURT,10) TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30) AREA,PLSDAY,SWNO,OPTDN,FE
C
      WRITE(LURT,40)
C
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,65)
      WRITE(LURT,70)
      WRITE(LURT,80)
      WRITE(LURT,90)
      WRITE(LURT,100)
C
   10 FORMAT(1H0,'  REPORT 4:         ',4(A4),' ')
   20 FORMAT(1H ,'  -------------------------- ')
C
   30 FORMAT(1H0,'Table      Performance and utilisation of multiple
     &combination selected for',/,'               a ',F5.1,' ha operation
     &starting at day no.',I4,' (week',I3,') and optimum',/,'
     &         day no.',I4, ' at',I3,' % field efficiency together wit
     &h crop yield losses')
C
   40 FORMAT(1H0,  82('-'))
C
   50 FORMAT(1H ,'Ref No.      Proportional use',8x,'Operation use',7x,'
     &Performance')
   60 FORMAT(1H , 7x,24('-'),x,20('-'),x,20('-'),2x,' Yield')
   65 FORMAT(1H , 57x,'+',5x,'*',6x,'@')
   70 FORMAT(1H ,'      of Plough Cult- Till- Drill Plough Culti- Drill Pl
     &ough Cult. Drill',6X,'loss')
   80 FORMAT(1H ,8x,'ing   ivat   age   ing   ing   vation  ing    work'
     &,2x,'work  work')
   90 FORMAT(1H ,'      tr',9x,'ion',35x,' rate  rate  rate      value')
  100 FORMAT(1H ,'no.',29x,' (h)',5x,'(h)    (h)  (ha/h)(ha/h)(ha/h)',6x
     &,'(%)')
C
      WRITE(LURT,110)
  110 FORMAT(1H ,82('-'))
C
      DO 200 K = 1,ID
C
      READ(6,400) SSWNO,SWEEKN,SDAYN,PCDAYN,SPDAYS,DNR,CDAYN,
     &            DPP,DSALV,DREPC,DPANC,DACF,DLCOST,DFUCT,ELOSS,DINSCY,
     &           DLOSS,AVERY,AVRLOS,ADR,DRWW,DRW,ADSP,DHOURS,TDANC,FTDH,
     &            DSHTCY,DCAV,DMORTV,DAINTC,DNPMV,DBC
```

APPENDIX 5 cont'd

```
  400 FORMAT(1H , 7(I6),7(F10.2),4(F9.4),F9.4,4(F8.3),2(F8.2),F5.3,
     &           F8.2,5(F10.2))
 c
      READ(8,500) CPP,CSALV,CREPC,CPANC,CFUCT,CLCOST,CACF,TCANC,
     &            ACSP,CHOURS,ACWR,CWIDTH,CINSCY,FTCH,NCULC,CULSDN,
     &            CULFDN,CWEEKN,PCWEEK,CPDAYS,CSHTCY,CCAV,CMORTV,
     &            CAINTC,CNPMV,CBC,XX,TTREPC,TTPANC
      IF (NIOORS.EQ.0) FTCH = 0
      IF (NIOORS.EQ.0) ACWR = 0
      IF (NIOORS.EQ.0) CWIDTH = 0
      IF (NIOORS.EQ.0) CHOURS = 0
  500 FORMAT(1H , 8(F10.2),6(F10.3),6(I6),F10.2,8(F10.5))
      WRITE(LURT,600) K,NOTR(K),FTPH(K),FTCH,FTTH(K),FTDH,PHOURS(K),
     &                CHOURS,DHOURS,TCAPR(K),ACWR,ADR,YLOSSC(K)
  600 FORMAT(1H ,I3,x,I2,2(2x,F4.2),2x,F4.2,3x,F4.2,3(x,F6.2),x,
     &2(F5.2,x),F5.2,2x,F10.2)
 c
  200 CONTINUE
 c
      WRITE(LURT,120)
  120 FORMAT(1H , 82('-'))
 c
      WRITE(LURT,130)
      WRITE(LURT,140)
      WRITE(LURT,145)
      WRITE(LURT,150)
  130 FORMAT(1H ,' Tr = Tractors')
  140 FORMAT(1H ,'  +  Plough work rate for tractor fleet')
  145 FORMAT(1H ,'  *  Cult.=cultivator; work rate only using one tr
     &actor')
  150 FORMAT(1H ,'  @  Drill work rate only using one tractor.')
 c
      CLOSE(UNIT=6)
      CLOSE(UNIT=8)
      RETURN
 c
      END
```

APPENDIX 5 cont'd

11.5 REPORT 5

```
C
      OPEN(UNIT=6,NAME='MSCALC6.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=7,NAME='MSCALC7.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=8,NAME='MSCALC8.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      REWIND (UNIT=6)
      REWIND(UNIT=7)
      REWIND (UNIT=8)
C
      WRITE(LURT,10) TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30) TPAGE
C
      WRITE(LURT,40)
C
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,70)
      WRITE(LURT,80)
      WRITE(LURT,90)
      WRITE(LURT,120)
C
        WRITE(LURT,130)
C
   10 FORMAT(1H0,'  REPORT  5:     ',4(A4),'  ')
   20 FORMAT(1H ,'  ------------------------ ')
C
   30 FORMAT(1H0,'  Table     Tractor costs in different operations
     &for a period of ownership of',/',              ',I2,' year(s)')
C
   40 FORMAT(1H0,  80('-'))
   50 FORMAT(1H ,'Ref',15x,' Tractor present cost   Tractor repair cost
     & Insur- Tax Shelter')
   60 FORMAT(1H ,  19X,22('-'),X,18('-'),4X,'ance')
   70 FORMAT(1H , 9x,'Purchase  Plough  Culti-   Drill Plough Culti-
     &  Drill')
   80 FORMAT(1H ,'   Power  price      ing   vation    ing   ing   vat
     &ion   ing   cost  cost  cost')
   90 FORMAT(1H ,'no. (kW)    ($)       ($)    ($)      ($)    ($)    ($)
     &    ($)   ($)   ($)   ($)')
C
  120 FORMAT(1H ,  80('-'))
C
       DO 200 K = 1,ID
C
       READ(6,400) SSWNO,SWEEKN,SDAYN,PCDAYN,SPDAYS,DNR,CDAYN,
     &             DPP,DSALV,DREPC,DPANC,DACF,DLCOST,DFUCT,ELOSS,DINSCY,
     &            DLOSS,AVERY,AVRLOS,ADR,DRWW,DRW,ADSP,DHOURS,TDANC,FTDH,
     &             DSHTCY,DCAV,DMORTV,DAINTC,DNPMV,DBC
  400 FORMAT(1H , 7(I6),7(F10.2),4(F9.4),F9.4,4(F8.3),2(F8.2),F5.3,
     &             F8.2,5(F10.2))
```

APPENDIX 5 cont'd

```
C
      READ(7,700) WEEKNO,PDAYS,CPDAYN,TINSCY,PINSCY,
     &            TPP,PPP,TSALV,PSALV,X(K),XXX,Z,TREPC,TPREPC,
     &            PREPC,TPPANC,PPANC,TACF,PACF,TLCOST,OPCOST,
     &            TSHTCY,PSHTCY,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
     &            TNPMV,PNPMV,TBC,PBC,SUM,SUM11,SUM51,SUM52,SUM1,SUM22,
     &            SUM61,SUM62
  700 FORMAT(1H , 3(I6),6(F10.2),3(F8.3),7(F11.2),2(F12.2),2(F12.2),
     &            10(F10.2),8(F10.2))
C
      READ(8,500) CPP,CSALV,CREPC,CPANC,CFUCT,CLCOST,CACF,TCANC,
     &            ACSP,CHOURS,ACWR,CWIDTH,CINSCY,FTCH,NCULC,CULSDN,
     &            CULFDN,CWEEKN,PCWEEK,CPDAYS,CSHTCY,CCAV,CMORTV,
     &            CAINTC,CNPMV,CBC,XX,TTREPC,TTPANC
  500 FORMAT(1H , 8(F10.2),6(F10.3),6(I6),F10.2,8(F10.2))
C
      WRITE(LURT,130) K,ENGINE(K),TPP,TPPANC,TCANC,TDANC,TPREPC,
     &                TCREPC(K),TDREPC(K),TINSCY,TTAXCY,TSHTCY
  130 FORMAT(1H , 2(I3,X),X,F8.2,3(X,F7.1),3(X,F6.1),3(X,F5.1))
C
  200 CONTINUE
C
      WRITE(LURT,150)
  150 FORMAT(1H , 80('-'))
C
      WRITE(LURT,160)
      WRITE(LURT,170)
  160 FORMAT(1H0,'  *  Repair cost only for ploughing operation')
  170 FORMAT(1H ,'     based on ploughing hours divided by 1000.')
C
      CLOSE(UNIT=6)
      CLOSE(UNIT=7)
      CLOSE(UNIT=8)
      RETURN
C
      END
```

APPENDIX 5 cont'd

11.6 REPORT 6

```
C
      OPEN(UNIT=5,NAME='MSCALC5.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      OPEN(UNIT=7,NAME='MSCALC7.RES ,..
     &     ACCESS='SEQUENTIAL',FORM= FORMATTED ,..
C
      OPEN(UNIT=9,NAME= MSCALC.
     &     ACCESS='SEQUENTIAL ,FORM
      REWIND (UNIT=5)
      REWIND (UNIT=7)
      REWIND (UNIT=9)
C
      COUNT = 0
      L = 1
      DO 6000 K = 1,ID,5
      J = 0
      DO 5 I = 1,5
C
      COUNT = COUNT + 1
      IF (COUNT.GT.ID) GOTO 6
      J = J + 1
C
      READ(5,1170) IDDD,PCD,PCW,SSW,CI,FWLD,WDLD,PTWT,PWT,TWT,
     &             WF,WR,FWW,RWW,FTSH,TRSH,FTDF,TRDF,FWD,TRD
 1170 FORMAT(1H , I4,4(F8.3),15(F10.3))
      READ(9,1151) FMN,WMN,FSLIP,RSLIP,CRRF,CRR,RRF,RRR,CTMAXF,
     &             CTMAX,CTF,CT,FK,RK,TMAXF,TMAXR,TMAX,TF1,TR2,
     &             TFR,TE,PD,TR,APS,APULL,TPULL,TRATIO,
     &             TPOWER
 1151 FORMAT(1H , 28(F10.4))
C
      READ(7,11) WEEKNO,PDAYS,CPDAYN,TINSCY,PINSCY,
     &           TPP,PPP,TSALV,PSALV,X(L),XXX,Z,TREPC,TPREPC,
     &           PREPC,TPPANC,PPANC,TACF,PACF,TLCOST,OPCOST,
     &           TSHTCY,PSHTCY,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
     &           TNPMV,PNPMV,TBC,PBC,SUM,SUM11,SUM51,SUM52,SUM1,SUM22,
     &           SUM61,SUM62
   11 FORMAT(1H ,  3(I6),6(F10.2),3(F8.3),7(F11.2),2(F12.2),2(F12.2),
     &             10(F10.2),8(F10.2))
C
       ANOTR(I) = NOTR(L)
      SCOMBN(I) = IDDD
       MAXEP(I) = ENGINE(L)
        TRKW(I) = PTWT
         FWF(I) = WF
         RWR(I) = WR
        FFTW(I) = FTW
        FFRD(I) = FRD
       PTOFF(I) = PTOP(L)
      FFINFP(I) = FINFP
        PLWT(I) = PWT
        TRWT(I) = TWT
       KGKWR(I) = TRATIO
       MAXAP(I) = APULL
      TMPULL(I) = TMAX
```

APPENDIX 5 cont'd

```
          WS(I) = TSLIP(L)
        RIMD(I) = RMD
        TRSW(I) = TRW
      TINPRE(I) = TINFP
      DRAWBP(I) = DRBKW(L)
      RFORCE(I) = RRF
        RRRR(I) = RRR
C
      PDRAFT(I) = PD
       PBODY(I) = BODIES(L)
        PFSP(I) = APS
      PDEPTH(I) = PCD
      PWIDTH(I) = PCW
        PLWT(I) = PWT
      APRATE(I) = PERHR(L)
C
        SSPW(I) = SSW
      CONEIN(I) = CI
       FCAPY(I) = FC
       MCONT(I) = MCWW
      WORKAB(I) = WABY
      PROBAL(I) = PROB
C
      PSDAYN(I) = PLSDAY
      EXFPDN(I) = PLCDAY
      CDAYNO(I) = FPDAYN(L)
        PDAY(I) = PDAYS
       RRPDS(I) = RPDS(L)
       FWEEK(I) = WEEKNO
C
      TPRICE(I) = TPP
      PPRICE(I) = PPP
       TANNC(I) = TPANC(L)
       PANNC(I) = PPANC
      TPANNC(I) = TPPANC
       FUELC(I) = TFUCT(L)
      LABOUR(I) = TLCOST
      OTHERC(I) = OPCOST
      COMCOT(I) = TCCOST(L)
      TRPLCT(I) = YLCCOT(L)
C
      L = L + 1
    5 CONTINUE
    6 CONTINUE
C
      WRITE(LURT,10)  TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30)   AREA,SWNO,EXFPWN,FE
C
      WRITE(LURT,40)
C
      WRITE(LURT,59)   (SCOMBN(I),I=1,J)
      WRITE(LURT,60)   ( ANOTR(I),I=1,J)
      WRITE(LURT,80)
C
      WRITE(LURT,90)
      WRITE(LURT,99)   ( MAXEP(I),I=1,J)
      WRITE(LURT,101)  ( PTOFF(I),I=1,J)
      WRITE(LURT,110)  (DRAWBP(I),I=1,J)
```

APPENDIX 5 cont'd

```
      WRITE(LURT,111)  (  TRKW(I),I=1,J)
      WRITE(LURT,120)  (  TRWT(I),I=1,J)
      WRITE(LURT,130)  ( KGKWR(I),I=1,J)
      WRITE(LURT,139)
      WRITE(LURT,140)  (   FWF(I),I=1,J)
      WRITE(LURT,141)  (   RWR(I),I=1,J)
      WRITE(LURT,150)  (  FFTW(I),FFRD(I),I=1,J)
      WRITE(LURT,151)  (  TRSW(I),RIMD(I),I=1,J)
      WRITE(LURT,160)  (FFINFP(I),I=1,J)
      WRITE(LURT,161)  (TINPRE(I),I=1,J)
      WRITE(LURT,170)  (    WS(I),I=1,J)
      WRITE(LURT,180)  ( MAXAP(I),I=1,J)
      WRITE(LURT,190)  (RFORCE(I),I=1,J)
      WRITE(LURT,191)  (  RRRR(I),I=1,J)
      WRITE(LURT,200)  (TMPULL(I),I=1,J)
C
      WRITE(LURT,210)
      WRITE(LURT,220)  ( PBODY(I),I=1,J)
      WRITE(LURT,230)  (  PLWT(I),I=1,J)
      WRITE(LURT,240)  (  PFSP(I),I=1,J)
      WRITE(LURT,250)  (PDEPTH(I),I=1,J)
      WRITE(LURT,260)  (PWIDTH(I),I=1,J)
      WRITE(LURT,270)  (APRATE(I),I=1,J)
      WRITE(LURT,271)  (PDRAFT(I),I=1,J)
C
      WRITE(LURT,310)
      WRITE(LURT,320)  (  SSPW(I),I=1,J)
      WRITE(LURT,330)  (CONEIN(I),I=1,J)
      WRITE(LURT,340)  ( FCAPY(I),I=1,J)
      WRITE(LURT,350)  ( MCONT(I),I=1,J)
      WRITE(LURT,360)  (WORKAB(I),I=1,J)
      WRITE(LURT,370)  (PROBAL(I),I=1,J)
C
      WRITE(LURT,89)
      WRITE(LURT,91)   (PSDAYN(I),I=1,J)
      WRITE(LURT,22)   ( RRPDS(I),I=1,J)
      WRITE(LURT,21)   (EXFPDN(I),I=1,J)
      WRITE(LURT,92)   (CDAYNO(I),I=1,J)
      WRITE(LURT,93)   (  PDAY(I),I=1,J)
      WRITE(LURT,94)   ( FWEEK(I),I=1,J)
C
      WRITE(LURT,380)
      WRITE(LURT,390)  (TPRICE(I),I=1,J)
      WRITE(LURT,400)  (PPRICE(I),I=1,J)
      WRITE(LURT,410)  ( TANNC(I),I=1,J)
      WRITE(LURT,420)  ( PANNC(I),I=1,J)
      WRITE(LURT,430)  (TPANNC(I),I=1,J)
      WRITE(LURT,440)  ( FUELC(I),I=1,J)
      WRITE(LURT,450)  (LABOUR(I),I=1,J)
      WRITE(LURT,460)  (OTHERC(I),I=1,J)
C
      WRITE(LURT,470)
      WRITE(LURT,480)  (COMCOT(I),I=1,J)
      WRITE(LURT,490)
C
      WRITE(LURT,520)  (TRPLCT(I),I=1,J)
      WRITE(LURT,502)
C
   10 FORMAT(1H0,' REPORT 6:     ',4(A4),'     ')
   20 FORMAT(1H ,' ------------------------')
```

APPENDIX 5 cont'd

```
c
   30 FORMAT(1H0,'Table   Feasible tractor-plough combinations for plo
     &ughing ',F5.1,' ha, ',/,'              operation starting at week'
     &,I3,' and expected to finish at week',I3,', ',/,'               at'
     &,I3,'% field efficiency')
c
   40 FORMAT(1H0,  74('-'))
   59 FORMAT(1H ,'  Single combination no.   ',5(x,I6,3x))
   60 FORMAT(1H ,'  Number tractors          ',5(x,I6,3x))
   80 FORMAT(1H ,  74('-'))
c
   90 FORMAT(1H0,'Tractor specification:     ')
   99 FORMAT(1H ,'  max. power required (kW)',5(x,I9))
  101 FORMAT(1H ,'  P.T.O. power        (kW)',5(x,F9.2))
  110 FORMAT(1H ,'  drawbar power       (kW)',5(x,F9.2))
  111 FORMAT(1H ,'  static weight       (kN)',5(x,F9.2))
  120 FORMAT(1H ,'  dynamic weight      (kN)',5(x,F9.2))
  130 FORMAT(1H ,'  weight/power     (kg/kW)',5(x,F9.2))
  139 FORMAT(1H ,'  dynamic axle load       ')
  140 FORMAT(1H ,'    front             (kN)',5(x,F9.2))
  141 FORMAT(1H ,'    rear              (kN)',5(x,F9.2))
  150 FORMAT(1H ,'  front tyre dimension(in)',5(x,F4.1,'-',F4.1))
  151 FORMAT(1H ,'  rear tyre dimension (in)',5(x,F4.1,'-',F4.1))
  160 FORMAT(1H ,'  front tyre pressure(kPa)',5(x,F9.2))
  161 FORMAT(1H ,'  rear tyre pressure (kpa)',5(x,F9.2))
  170 FORMAT(1H ,'  wheel slip           (%)',5(x,F9.2))
  180 FORMAT(1H ,'  actual thrust       (kN)',5(x,F9.2))
  190 FORMAT(1H ,'  front rolling res.  (kN)',5(x,F9.2))
  191 FORMAT(1H ,'  rear rolling res.   (kN)',5(x,F9.2))
  200 FORMAT(1H ,'  maximum thrust      (kN)',5(x,F9.2))
c
  210 FORMAT(1H0,'Plough specification:     ')
  220 FORMAT(1H ,'  bodies                  ',5(x,I6,3x))
  230 FORMAT(1H ,'  weight              (kN)',5(x,F9.2))
  240 FORMAT(1H ,'  forward speed     (km/h)',5(x,F9.2))
  250 FORMAT(1H ,'  cut depth            (m)',5(x,F9.2))
  260 FORMAT(1H ,'  cut width            (m)',5(x,F9.2))
  270 FORMAT(1H ,'  actual work rate  (ha/h)',5(x,F9.2))
  271 FORMAT(1H ,'  draught             (kN)',5(x,F9.2))
c
  310 FORMAT(1H0,'Soil specification:       ')
  320 FORMAT(1H ,'  specific weight  (kN/m3)',5(x,F9.2))
  330 FORMAT(1H ,'  cone index       (kN/m2)',5(x,F9.4))
  340 FORMAT(1H ,'  field capacity      (mm)',5(x,F9.2))
  350 FORMAT(1H ,'  moisture content  (%w/w)',5(x,F9.2))
  360 FORMAT(1H ,'  workability    (% of FC)',5(x,I9))
  370 FORMAT(1H ,'  probability level    (%)',5(x,I9))
c
   89 FORMAT(1H0,'Operating condition       ')
   91 FORMAT(1H ,'  plough start day no     ',5(x,I9))
   22 FORMAT(1H ,'  no. of ploughing days   ',5(x,I9))
   21 FORMAT(1H ,'  expected finish day no  ',5(x,I9))
   92 FORMAT(1H ,'  plough finish day no    ',5(x,I9))
   93 FORMAT(1H ,'  plough penalty days     ',5(x,I9))
   94 FORMAT(1H ,'  plough finish week no   ',5(x,I9))
c
  380 FORMAT(1H0,'Operational cost:      ($)',$)
  390 FORMAT(1H ,'  tractor purchase price  ',5(x,F9.2))
  400 FORMAT(1H ,'  plough purchase price   ',5(x,F9.2))
  410 FORMAT(1H ,'  tractor annual cost     ',5(x,F9.2))
```

APPENDIX 5 cont'd

```
  420 FORMAT(1H ,'  plough annual cost       ',5(x,F9.2))
  430 FORMAT(1H ,'  tractor ann. cost/plough',5(x,F9.2))
  440 FORMAT(1H ,'  fuel cost                ',5(x,F9.2))
  450 FORMAT(1H ,'  labour cost              ',5(x,F9.2))
  460 FORMAT(1H ,'  other operating cost     ',5(x,F9.2))
c
  470 FORMAT(1H0,  74('-'))
  480 FORMAT(1H ,'Single combination cost($)',5(x,F9.2))
  490 FORMAT(1H ,  74('-'))
c
  510 FORMAT(1H ,   74('-'))
  520 FORMAT(1H0,'Total ploughing cost   ($)',5(x,F9.1))
c
  502 FORMAT(1H0,  74('-'))
c
 6000 CONTINUE
c
      CLOSE(UNIT=5)
      CLOSE(UNIT=7)
      CLOSE(UNIT=9)
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

11.7 REPORT 7

```
C
      IF (NIOORS.EQ.0) GOTO 32767
      OPEN(UNIT=8,NAME='MSCALC8.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      REWIND (UNIT=8)
C
      COUNT = 0
      L = 1
      DO 6000 K = 1,ID,5
      J = 0
      DO 5 I= 1,5
C
      COUNT = COUNT + 1
      IF (COUNT.GT.ID) GOTO 6
      J = J + 1
C
      READ(8,266) CPP,CSALV,CREPC,CPANC,CFUCT,CLCOST,CACF,TCANC,
     &            ACSP,CHOURS,ACWR,CWIDTH,CINSCY,FTCH,NCULC,CULSDN,
     &            CULFDN,CWEEKN,PCWEEK,CPDAYS,CSHTCY,CCAV,CMORTV,
     &            CAINTC,CNPMV,CBCXX,TTREPC,TTPANC
  266 FORMAT(1H , 8(F10.2),6(F10.3),6(I6),F10.2,8(F10.2))
C
       ANOTR(I) = SINE(L)
       MAXEP(I) = ENGINE(L)
        CCNF(I) = CNF
       CCWTH(I) = CWIDTH
       ACCSP(I) = ACSP
       ACCWR(I) = ACWR
C
      CULSWN(I) = CWWN(L)
      CCULSD(I) = CULSDN
       RRCDS(I) = RCDS(L)
      CCULFD(I) = CULFDN
      AVWDAY(I) = PCWEEK
      FCCLDN(I) = FCULDN(L)
       CCPDS(I) = CPDAYS
       CCWNO(I) = CWEEKN
C
       CCAAP(I) = CAAP
      CCPAGE(I) = CPAGE
       CCAAS(I) = CAAS
C
        CCPP(I) = CPP
      CCSALV(I) = CSALV
      CCREPC(I) = CREPC
      CCPANC(I) = CPANC
       CCACF(I) = CACF
      CINSUR(I) = CINSCY
      CSHELT(I) = CSHTCY
      CCFUCT(I) = CFUCT
      CCLCOT(I) = CLCOST
      TCCANC(I) = TCANC
      CULCOT(I) = CULCT(L)
      L = L + 1
```

APPENDIX 5 cont'd

```
    5 CONTINUE
    6 CONTINUE
C
      WRITE(LURT,10)  TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30)  AREA,FE
C
      WRITE(LURT,40)
      WRITE(LURT,80)   ( ANOTR(I),I=1,J)
      WRITE(LURT,90)
      WRITE(LURT,99)
      WRITE(LURT,100)  ( MAXEP(I),I=1,J)
      WRITE(LURT,120)
      WRITE(LURT,140)  (  CCNF(I),I=1,J)
      WRITE(LURT,150)  ( CCWTH(I),I=1,J)
      WRITE(LURT,160)  ( ACCSP(I),I=1,J)
      WRITE(LURT,170)  ( ACCWR(I),I=1,J)
C
      WRITE(LURT,180)
      WRITE(LURT,190)  (CULSWN(I),I=1,J)
      WRITE(LURT,200)  (CCULSD(I),I=1,J)
      WRITE(LURT,201)  ( RRCDS(I),I=1,J)
      WRITE(LURT,210)  (CCULFD(I),I=1,J)
      WRITE(LURT,220)  (AVWDAY(I),I=1,J)
      WRITE(LURT,221)  (FCCLDN(I),I=1,J)
      WRITE(LURT,230)  ( CCPDS(I),I=1,J)
      WRITE(LURT,240)  ( CCWNO(I),I=1,J)
C
      WRITE(LURT,310)  ( CCAAP(I),I=1,J)
      WRITE(LURT,320)  (CCPAGE(I),I=1,J)
      WRITE(LURT,340)  ( CCAAS(I),I=1,J)
C
      WRITE(LURT,290)
      WRITE(LURT,300)  (  CCPP(I),I=1,J)
      WRITE(LURT,330)  (CCSALV(I),I=1,J)
      WRITE(LURT,350)  (CCREPC(I),I=1,J)
      WRITE(LURT,360)  (CCPANC(I),I=1,J)
      WRITE(LURT,370)  ( CCACF(I),I=1,J)
      WRITE(LURT,909)  (CINSUR(I),I=1,J)
      WRITE(LURT,707)  (CSHELT(I),I=1,J)
      WRITE(LURT,380)  (CCFUCT(I),I=1,J)
      WRITE(LURT,390)  (CCLCOT(I),I=1,J)
      WRITE(LURT,395)  (TCCANC(I),I=1,J)
C
   10 FORMAT(1H0,' REPORT 7:   ',4(A4),'    ')
   20 FORMAT(1H ,'  ------------------------')
C
   30 FORMAT(1H0,'Table     Feasible tractor-cultivator combination for
     &cultivating ',F5.1,' ha ',/,'                at',I3,' % field efficienc
     &y')
C
   40 FORMAT(1H0,  74('-'))
   80 FORMAT(1H0,'  Single combination no.   ',5(x,I9))
   90 FORMAT(1H ,  74('-'))
   99 FORMAT(1H0,'Tractor specification:    ')
  100 FORMAT(1H ,'  max. power required (kW)',5(x,I9))
C
  120 FORMAT(1H0,'Cultivator specification: ')
  140 FORMAT(1H ,'  no. of (blades/tines)/m ',5(x,I9))
```

APPENDIX 5 cont'd

```
  150 FORMAT(1H ,'  width                    (m)',5(x,F9.3))
  160 FORMAT(1H ,'  actual speed          (km/h)',5(x,F9.2))
  170 FORMAT(1H ,'  actual work rate      (ha/h)',5(x,F9.2))
c
  180 FORMAT(1H0,'Operating condition:        ')
  190 FORMAT(1H ,'  start week no               ',5(x,I9))
  200 FORMAT(1H ,'  start day no                ',5(x,I9))
  201 FORMAT(1H ,'no. of cult. days reqrd ',5(x,I9))
  210 FORMAT(1H ,'expected finish day no  ',5(x,I9))
  220 FORMAT(1H ,'  available work days         ',5(x,I9))
  221 FORMAT(1H ,'actual finish day no    ',5(x,I9))
  230 FORMAT(1H ,'  non work days               ',5(x,I9))
  240 FORMAT(1H ,'actual finish week no   ',5(x,I9))
c
  310 FORMAT(1H0,'  purchase age          (yr)',5(x,I6,3x))
  320 FORMAT(1H ,'  present age           (yr)',5(x,I6,3x))
  340 FORMAT(1H ,'salvage age             (yr)',5(x,I6,3x))
c
  290 FORMAT(1H0,'Operational cost:       ($)',$)
  300 FORMAT(1H ,'  purchase price              ',5(x,F9.2))
  330 FORMAT(1H ,'  salvage value               ',5(x,F9.2))
  350 FORMAT(1H ,'repair cost                 ',5(x,F9.2))
  360 FORMAT(1H ,'  present annual cost.        ',5(x,f9.2))
  370 FORMAT(1H ,'  annual cash flow            ',5(x,F9.2))
  909 FORMAT(1H0,'insurance            ($/yr)',5(x,F9.2))
  707 FORMAT(1H ,'shelter              ($/yr)',5(x,F9.2))
  380 FORMAT(1H ,'  fuel cost                   ',5(x,F9.2))
  390 FORMAT(1H,' labour cost                   ',5(x,F9.2))
  395 FORMAT(1H ,'* Tractor ann.cost/cult.  ',5(x,F9.2))
c
      WRITE(LURT,400)
  400 FORMAT(1H ,  74('-'))
c
      WRITE(LURT,410)  (CULCOT(I),I=1,J)
  410 FORMAT(1H ,'Cultivation cost        ($)',5(x,F9.2))
c
      WRITE(LURT,420)
  420 FORMAT(1H ,  74('-'))
c
 6000 CONTINUE
c
      CLOSE(UNIT=8)
c
32767 RETURN
c
      END
```

APPENDIX 5 cont'd

```
      11.8  REPORT 8
      ______________
c
      WRITE(LURT,10)
      WRITE(LURT,20)
      WRITE(LURT,30)  PCD,SSNAME
c
      WRITE(LURT,40)
c
      WRITE(LURT,50)
      WRITE(LURT,60)
      WRITE(LURT,70)
c
      WRITE(LURT,80)
c
      WRITE(LURT,90)  MCWW,MCFC,SLQWW,SLQFC,SPLWW,SPLFC,FC,SWPWW,SWPFC,
     &                CI
c
      WRITE(LURT,100)
   10 FORMAT(1H1,' REPORT 8:                   ')
   20 FORMAT(1H ,'-------------------------')
   30 FORMAT(1H0,'Table     Water properties at',F5.2,'m plough cut
     &depth for soil series ',4(A4))
c
   40 FORMAT(1H0,  81('-'))
c
   50 FORMAT(1H ,  x,'Moisture content',3x,'Liquid limit',
     &3x,'Plastic limit',4x,'Field',3x,'Wilting point',3x,'Cone')
   60 FORMAT(1H ,  x,14('-'),3X,14('-'),2X,14('-'),3X,'capacity',
     &x,13('-'),3x,'index')
   70 FORMAT(1H ,'(%,w/w)',x,'(%of FC)',2x,'(%,w/w)'x,'(%of FC)',
     &x,'(%,w/w)',x,'(%of FC)',x,'(mm)',3x,'(%,w/w)',x,'(%of FC) (MPa)
     & ')
c
   80 FORMAT(1H ,  81('-'))
c
   90 FORMAT(1H , F5.2,3X,F5.2,5X,F5.2,3X,F5.2,4X,F5.2,3X,F5.2,3X,
     &            F6.2,3X,F5.2,3X,F5.2,X,F7.3)
c
  100 FORMAT(1H ,  81('-'))
c
      WRITE(LURT,111)
  111 FORMAT(1H0,' FC = field capacity.')
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

11.9 REPORT 9

```
c
      DO 210 II = 1,4
        TDAYS(II) = 0
      DO 200 III = 1,13
      TDAYS(II) = TDAYS(II)+WDAYS(III+((II-1)*13))
  200 CONTINUE
  210 CONTINUE
c
      WRITE(LURT,10)
      WRITE(LURT,20)
      WRITE(LURT,30)  PROB,WABY,SSNAME
c
      WRITE(LURT,40)
c
      WRITE(LURT,50)
      WRITE(LURT,60)
c
      WRITE(LURT,70)
c
      WRITE(LURT,80)  (TDAYS(I),I=1,4)
c
      WRITE(LURT,90)
c
   10 FORMAT(1H1,'REPORT 9:                         ')
   20 FORMAT(1H ,'-------------------------------')
c
   30 FORMAT(1H0,'Table     Number of days available for tillage  opera
     &tions ',/,'           at varying probability level ',I3,' and
     &workability',/,'              ',I4,' % of FC in 4 quarters soil
     &series ',4(A4),'  ')
c
   40 FORMAT(1H0,  57('-'))
c
   50 FORMAT(1H ,  17x,'Number of workable days')
   60 FORMAT(1H ,  2x,'1st quarter',2x,'2nd quarter',2x,'3rd
     & quarter',2x,'4th quarter')
c
   70 FORMAT(1H ,  57('-'))
c
   80 FORMAT(1H ,  5x,4(I4,9x))
c
   90 FORMAT(1H ,  57('-'))
c
      RETURN
c
      END
```

APPENDIX 5 cont'd

11.10 REPORT 10

```
C
      OPEN(UNIT=6,NAME='MSCALC6.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      REWIND (UNIT=6)
C
      COUNT = 0
      L = 1
      DO 6000 K = 1,ID,5
      J = 0
      DO 5 I= 1,5
C
      COUNT = COUNT + 1
      IF (COUNT.GT.ID) GOTO 6
      J = J + 1
C
      READ(6,1170) SSWNO,SWEEKN,SDAYN,PCDAYN,SPDAYS,DNR,CDAYN,
     &        DPP,DSALV,DREPC,DPANC,DACF,DLCOST,DFUCT,ELOSS,DINSCY,
     &       DLOSS,AVERY,AVRLOS,ADR,DRWW,DRW,ADSP,DHOURS,TDANC,FTDH,
     &        DSHTCY,DCAV,DMORTV,DAINTC,DNPMV,DBC
 1170 FORMAT(1H , 7(I6),7(F10.2),4(F9.4),F9.4,4(F8.3),2(F8.2),F5.3,
     &        F8.2,5(F10.2))
C
       ANOTR(I) = SINE(L)
       MAXEP(I) = ENGINE(L)
        DDDRW(I) = DRW
       DDDNR(I) = DNR
         DDRW(I) = DRWW
         DDSP(I) = ADSP
        DRATE(I) = ADR
C
       SSWKNO(I) = SSWNO
       SDAYNO(I) = SDAYN
        RRDDS(I) = RDDS(L)
       OPTDNO(I) = OPTDN
       EXFDDN(I) = CDAYN
         DDAWD(I) = DAWDAY(L)
       PCDAYS(I) = PCDAYN
       DPDAYS(I) = SPDAYS
       DFWKNO(I) = SWEEKN
       EELOSS(I) = ELOSS
       DDLOSS(I) = DLOSS
        PLOSS(I) = AVRLOS
       PYIELD(I) = AVERY
C
        DDAAP(I) = DAAP
       DDPAGE(I) = DPAGE
        DDAAS(I) = DAAS
C
         DDPP(I) = DPP
       DDSALV(I) = DSALV
       DDREPC(I) = DREPC
       DDPANC(I) = DPANC
        DDACF(I) = DACF
       DINSUR(I) = DINSCY
```

APPENDIX 5 cont'd

```
      DSHELT(I) = DSHTCY
      DDFUCT(I) = DFUCT
      DINSUR(I) = DINSCY
      DLABOR(I) = DLCOST
      TDANNC(I) = TDANC
      CDCOST(I) = DRCOST(L)
      LOSSES(I) = YLOSSC(L)
      TPDYCT(I) = TOTALS(L)
       L = L + 1
    5 CONTINUE
    6 CONTINUE
C
      WRITE(LURT,10) TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30)   AREA,FE
C
      WRITE(LURT,40)
C
      WRITE(LURT,80)  ( ANOTR(I),I=1,J)
      WRITE(LURT,90)
C
      WRITE(LURT,99)
      WRITE(LURT,100)   (MAXEP(I),I=1,J)
      WRITE(LURT,120)
      WRITE(LURT,130)   (DDDRW(I),I=1,J)
      WRITE(LURT,140)   (DDDNR(I),I=1,J)
      WRITE(LURT,150)   ( DDRW(I),I=1,J)
      WRITE(LURT,160)   (  DDSP(I),I=1,J)
      WRITE(LURT,170)   (DRATE(I),I=1,J)
C
      WRITE(LURT,180)
      WRITE(LURT,190)   (SSWKNO(I),I=1,J)
      WRITE(LURT,200)   (SDAYNO(I),I=1,J)
      WRITE(LURT,201)   ( RRDOS(I),I=1,J)
      WRITE(LURT,210)   (OPTDNO(I),I=1,J)
      WRITE(LURT,211)   (EXFDDN(I),I=1,J)
      WRITE(LURT,220)   ( DDAWD(I),I=1,J)
      WRITE(LURT,230)   (DPDAYS(I),I=1,J)
      WRITE(LURT,231)   (PCDAYS(I),I=1,J)
      WRITE(LURT,240)   (DFWKNO(I),I=1,J)
      WRITE(LURT,250)   (EELOSS(I),I=1,J)
      WRITE(LURT,260)   (DDLOSS(I),I=1,J)
      WRITE(LURT,270)   (  PLOSS(I),I=1,J)
      WRITE(LURT,280)   (PYIELD(I),I=1,J)
C
      WRITE(LURT,310)   ( DDAAP(I),I=1,J)
      WRITE(LURT,320)   (DDPAGE(I),I=1,J)
      WRITE(LURT,340)   ( DDAAS(I),I=1,J)
C
      WRITE(LURT,290)
      WRITE(LURT,300)   (   DDPP(I),I=1,J)
      WRITE(LURT,330)   (DDSALV(I),I=1,J)
      WRITE(LURT,350)   (DDREPC(I),I=1,J)
      WRITE(LURT,360)   (DDPANC(I),I=1,J)
      WRITE(LURT,370)   ( DDACF(I),I=1,J)
      WRITE(LURT,380)   (DDFUCT(I),I=1,J)
      WRITE(LURT,909)   (DINSUR(I),I=1,J)
      WRITE(LURT,707)   (DSHELT(I),I=1,J)
      WRITE(LURT,390)   (DLABOR(I),I=1,J)
```

APPENDIX 5 cont'd

```
      WRITE(LURT,395)  (TDANNC(I),I=1,J)
C
   10 FORMAT(1H0,' REPORT 10:    ',4(A4),'   ')
   20 FORMAT(1H ,' -------------------------')
C
   30 FORMAT(1H0,'Table     Feasible tractor-drill combination for
     &drilling ',F5.1,' ha, at',I3,'  ',/,'              % field efficiency
     &')
C
   40 FORMAT(1H0,  74('-'))
   80 FORMAT(1H0,'  Single combination no.  ',5(x,I9))
   90 FORMAT(1H ,  74('-'))
   99 FORMAT(1H0,'Tractor specification:     ')
  100 FORMAT(1H ,'  max. power required (kW)',5(x,I9))
C
  120 FORMAT(1H0,'Drill specification:       ')
  130 FORMAT(1H ,'  coulter width        (m)',5(x,F9.3))
  140 FORMAT(1H ,'  number of coulters      ',5(x,I9))
  150 FORMAT(1H ,'  width                (m)',5(x,F9.3))
  160 FORMAT(1H ,'  actual speed      (km/h)',5(x,F9.2))
  170 FORMAT(1H ,'  actual work rate  (ha/h)',5(x,F9.2))
C
  180 FORMAT(1H0,'Operating condition:       ')
  190 FORMAT(1H ,'  start week no           ',5(x,I9))
  200 FORMAT(1H ,'  start day no            ',5(x,I9))
  201 FORMAT(1H ,'  no. of drilling days    ',5(x,I9))
  210 FORMAT(1H ,'  optimum day no          ',5(x,I9))
  211 FORMAT(1H ,'  expected finish day no  ',5(x,I9))
  220 FORMAT(1H ,'  available work days     ',5(x,I9))
  230 FORMAT(1H ,'  non work days           ',5(x,I9))
  231 FORMAT(1H ,'  actual finish day no    ',5(x,I9))
  240 FORMAT(1H ,'  actual finish week no   ',5(x,I9))
  250 FORMAT(1H ,'  average early loss   (%)',5(x,F9.4))
  260 FORMAT(1H ,'  average late loss    (%)',5(x,F9.4))
  270 FORMAT(1H ,'  average crop loss    (%)',5(x,F9.4))
  280 FORMAT(1H ,'  average crop yield(t/ha)',5(x,F9.4))
C
  310 FORMAT(1H0,'  purchase age        (yr)',5(x,I6,3x))
  320 FORMAT(1H ,'  present age         (yr)',5(x,I6,3x))
  340 FORMAT(1H ,'  salvage age         (yr)',5(x,I6,3x))
C
  290 FORMAT(1H0,'Operational cost:      ($)',$)
  300 FORMAT(1H ,'  purchase price          ',5(x,F9.2))
  330 FORMAT(1H ,'  salvage value           ',5(x,F9.2))
  350 FORMAT(1H ,'  repair cost             ',5(x,F9.2))
  360 FORMAT(1H ,'  present annual cost     ',5(x,f9.2))
  370 FORMAT(1H ,'  annual cash flow        ',5(x,F9.2))
  380 FORMAT(1H ,'  fuel cost               ',5(x,F9.2))
  909 FORMAT(1H ,'  insurance         ($/yr)',5(x,F9.2))
  707 FORMAT(1H ,'  shelter           ($/yr)',5(x,F9.2))
  390 FORMAT(1H ,'  labour cost             ',5(x,F9.2))
  395 FORMAT(1H ,'* Tractor ann.cost/drill  ',5(x,F9.2))
C
      WRITE(LURT,400)
  400 FORMAT(1H ,   74('-'))
C
      WRITE(LURT,410)  (CDCOST(I),I=1,J)
  410 FORMAT(1H ,'Drilling cost          ($) ',5(x,F9.2))
C
      WRITE(LURT,420)
```

APPENDIX 5 cont'd

```
 420 FORMAT(1H ,  74('-'))
C
     WRITE(LURT,430)  (LOSSES(I),I=1,J)
 430 FORMAT(1H ,'Yield loss cost         ($)',5(x,F9.2))
C
     WRITE(LURT,440)
 440 FORMAT(1H ,  74('-'))
C
     WRITE(LURT,450)  (TPDYCT(I),I=1,J)
 450 FORMAT(1H0,'Total operation cost   ($)',5(x,F9.2))
C
     WRITE(LURT,460)
 460 FORMAT(1H0,  74('-'))
C
6000 CONTINUE
C
     CLOSE(UNIT=5)
     CLOSE(UNIT=7)
C
     RETURN
C
     END
```

APPENDIX 5 cont'd

11.11 REPORT 11

```
C
      OPEN(UNIT=5,NAME='MSCALC5.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=8,NAME='MSCALC8.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
      OPEN(UNIT=9,NAME='MSCALC9.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      OPEN(UNIT=7,NAME='MSCALC7.RES',TYPE='UNKNOWN',
     &     ACCESS='SEQUENTIAL',FORM='FORMATTED',RECL=512)
C
      REWIND (UNIT=5)
      REWIND (UNIT=7)
      REWIND (UNIT=8)
      REWIND (UNIT=9)
C
      COUNT = 0
      L = 1
      DO 700 K =1,ID,5
      J = 0
      DO 5 I = 1,5
C
      COUNT = COUNT + 1
      IF (COUNT.GT.ID) GOTO 6
      J = J + 1
C
      READ(5,1170) IDDD,PCD,PCW,SSW,CI,FWLD,WDLD,PTWT,PWT,TWT,
     &            WF,WR,FWW,RWW,FTSH,TRSH,FTDF,TRDF,FWD,TRD
 1170 FORMAT(1H , I4,4(F8.3),15(F10.3))
      READ(9,1155) FMN,WMN,FSLIP,RSLIP,CRRF,CRR,RRF,RRR,CTMAXF,
     &            CTMAX,CTF,CT,FK,RK,TMAXF,TMAXR,TMAX,TF1,TR2,
     &            TFR,TE,PD,TR,APS,APULL,TPULL,TRATIO,
     &            TPOWER
 1155 FORMAT(1H , 28(F10.4))
C
      READ(7,11) WEEKNO,PDAYS,CPDAYN,TINSCY,PINSCY,
     &          TPP,PPP,TSALV,PSALV,X(K),XXX,Z,TREPC,TPREPC,
     &          PREPC,TPPANC,PPANC,TACF,PACF,TLCOST,OPCOST,
     &          TSHTCY,PSHTCY,TCAV,PCAV,TMORTV,PMORTV,TAINTC,PAINTC,
     &          TNPMV,PNPMV,TBC,PBC,SUM,SUM11,SUM51,SUM52,SUM1,SUM22,
     &          SUM61,SUM62
   11 FORMAT(1H , 3(I6),6(F10.2),3(F8.3),7(F11.2),2(F12.2),2(F12.4),
     &          10(F10.2),8(F10.2))
C
      READ(8,266) CPP,CSALV,CREPC,CPANC,CFUCT,CLCOST,CACF,TCANC,
     &           ACSP,CHOURS,ACWR,CWIDTH,CINSCY,FTCH,NCULC,CULSDN,
     &           CULFDN,CWEEKN,PCWEEK,CPDAYS,CSHTCY,CCAV,CMORTV,
     &           CAINTC,CNPMV,CBC,XX,TTREPC,TTPANC
  266 FORMAT(1H , 8(F10.0),6(F10.3),6(I6),F10.2,8(F10.2))
C
       SCOMBN(I)= IDDD
          FWF(I)= WF
           RWR(I) = WR
       MAXEP(I) = ENGINE(L)
       PBODY(I) = BODIES(L)
```

APPENDIX 5 cont'd

```
      INTRES(I) = INTR
      INVRES(I) = INVR
        CCFW(I) = TAXR
      INFLAR(I) = INFR
      TPRICE(I) = TPP
      PURAGE(I) = TAAP
       TSALE(I) = TSALV
      SALAGE(I) = TAAS
         TAX(I) = TTAXCY
      INSURA(I) = TINSCY
      TSHELT(I) = TSHTCY
      TYHOUR(I) = TTUSEH
       TPLHR(I) = PHOURS(L)
         TPX(I) = X(L)
        TPXX(I) = XX
       TPXXX(I) = XXX
        XREP(I) = TREPC
       XXREP(I) = TTREPC
      XXXREP(I) = TPREPC
       TANNC(I) = TPANC(L)
      TTANNC(I) = TTPANC
      TPANNC(I) = TPPANC
      TCASHF(I) = TACF
      PPRICE(I) = PPP
       PPAGE(I) = IPAGE
       PSALE(I) = PSALV
      PSALEG(I) = IAAS
      PINSUR(I) = PINSCY
      PSHELT(I) = PSHTCY
      PPREPC(I) = Z
      PYREPC(I) = PREPC
       PANNC(I) = PPANC
      PCASHF(I) = PACF
C
      L = L + 1
    5 CONTINUE
    6 CONTINUE
C
      WRITE(LURT,10)  TYPE
      WRITE(LURT,20)
C
      WRITE(LURT,30)
C
      WRITE(LURT,40)
C
      WRITE(LURT,61)   (SCOMBN(I),I=1,J)
      WRITE(LURT,70)   (    FWF(I),I=1,J)
      WRITE(LURT,71)   (    RWR(I),I=1,J)
      WRITE(LURT,80)   ( MAXEP(I),I=1,J)
      WRITE(LURT,85)   ( PBODY(I),I=1,J)
      WRITE(LURT,90)
C
      WRITE(LURT,95)
      WRITE(LURT,100)  (INTRES(I),I=1,J)
      WRITE(LURT,1101) (INVRES(I),I=1,J)
      WRITE(LURT,1991) (  CCFW(I),I=1,J)
      WRITE(LURT,110)  (INFLAR(I),I=1,J)
C
      WRITE(LURT,115)
      WRITE(LURT,120)  (TPRICE(I),I=1,J)
```

APPENDIX 5 cont'd

```
      WRITE(LURT,130)  (PURAGE(I),I=1,J)
      WRITE(LURT,140)  ( TSALE(I),I=1,J)
      WRITE(LURT,150)  (SALAGE(I),I=1,J)
      WRITE(LURT,160)  (   TAX(I),I=1,J)
      WRITE(LURT,170)  (INSURA(I),I=1,J)
      WRITE(LURT,180)  (TSHELT(I),I=1,J)
      WRITE(LURT,190)  (TYHOUR(I),I=1,J)
      WRITE(LURT,200)  ( TPLHR(I),I=1,J)
      WRITE(LURT,215)  ( TPXXX(I),I=1,J)
      WRITE(LURT,218)  (  TPXX(I),I=1,J)
      WRITE(LURT,210)  (   TPX(I),I=1,J)
      WRITE(LURT,230)  (XXXREP(I),I=1,J)
      WRITE(LURT,225)  ( XXREP(I),I=1,J)
      WRITE(LURT,220)  (  XREP(I),I=1,J)
      WRITE(LURT,240)  (TPANNC(I),I=1,J)
      WRITE(LURT,250)  (TTANNC(I),I=1,J)
      WRITE(LURT,260)  ( TANNC(I),I=1,J)
      WRITE(LURT,270)  (TCASHF(I),I=1,J)
c
      WRITE(LURT,275)
      WRITE(LURT,280)  (PPRICE(I),I=1,J)
      WRITE(LURT,290)  ( PPAGE(I),I=1,J)
      WRITE(LURT,300)  ( PSALE(I),I=1,J)
      WRITE(LURT,310)  (PSALEG(I),I=1,J)
      WRITE(LURT,909)  (PINSUR(I),I=1,J)
      WRITE(LURT,320)  (PSHELT(I),I=1,J)
      WRITE(LURT,330)  (PPREPC(I),I=1,J)
      WRITE(LURT,340)  (PYREPC(I),I=1,J)
      WRITE(LURT,350)  ( PANNC(I),I=1,J)
      WRITE(LURT,360)  (PCASHF(I),I=1,J)
c
c
      WRITE(LURT,370)
c
   10 FORMAT(1H0,'  REPORT 11:    ',4(A4),'  ')
   20 FORMAT(1H ,'---------------------------')
c
   30 FORMAT(1H0,'Table     Tractor-plough combination cost
     &details')
c
   40 FORMAT(1H0,  74('-'))
c
   61 FORMAT(1H ,'  Single combination no.  ',5(x,I6,3x))
c
   70 FORMAT(1H ,'  front axle load      (kN)',5(x,F9.2))
   71 FORMAT(1H ,'  rear axle load       (kN)',5(x,F9.2))
   80 FORMAT(1H ,'  tractor power reqrd (kW)',5(x,I6,3x))
   85 FORMAT(1H ,'  Plough bodies            ',5(x,I6,3x))
   90 FORMAT(1H ,  74('-'))
c
   95 FORMAT(1H0,'Finance:                   ')
  100 FORMAT(1H ,'  loan interest rate       ',5(x,F9.2))
 1101 FORMAT(1H ,'  investment interst rate ',5(x,F9.2))
 1991 FORMAT(1H ,'  tax rate                 ',5(x,F9.2))
  110 FORMAT(1H ,'  inflation rate           ',5(x,F9.2))
c
  115 FORMAT(1H0,'Tractor:                   ')
  120 FORMAT(1H ,'  purchase price        ($)',5(x,F9.2))
  130 FORMAT(1H ,'  purchase age         (yr)',5(x,I6,3x))
  140 FORMAT(1H ,'  salvage price         ($)',5(x,F9.2))
```

APPENDIX 5 cont'd

```
  150 FORMAT(1H ,'  sale age              (yr)',5(x,I6,3x))
  160 FORMAT(1H ,'  road tax               ($)',5(x,F9.2))
  170 FORMAT(1H ,'  insurance              ($)',5(x,F9.2))
  180 FORMAT(1H ,'  shelter                ($)',5(x,F9.2))
  190 FORMAT(1H ,'  annual hours           (h)',5(x,I9))
  200 FORMAT(1H ,'  ploughing hours        (h)',5(x,I9))
  215 FORMAT(1H ,'  repair by ploughing (@%)',5(x,F9.2))
  218 FORMAT(1H ,'  repair by tillage   (@%)',5(x,F9.2))
  210 FORMAT(1H ,'  repair(% purchase price)',5(x,F9.2))
  230 FORMAT(1H ,'  repair by ploughing  ($)',5(x,F9.2))
  225 FORMAT(1H ,'  repair by tillage    ($)',5(x,F9.2))
  220 FORMAT(1H ,'  annual repair cost   ($)',5(x,F9.2))
  240 FORMAT(1H ,'  ann cost by ploughing($)',5(x,F9.2))
  250 FORMAT(1H ,'  ann cost by tillage  ($)',5(x,F9.2))
  260 FORMAT(1H ,'  annaul cost          ($)',5(x,F9.2))
  270 FORMAT(1H ,'  annual cash flow     ($)',5(x,F9.2))
c
  275 FORMAT(1H0,'Plough:                   ')
  280 FORMAT(1H ,'  purchase price       ($)',5(x,F9.2))
  290 FORMAT(1H ,'  purchase age        (yr)',5(x,I6,3x))
  300 FORMAT(1H ,'  salvage price        ($)',5(x,F9.2))
  310 FORMAT(1H ,'  sale age            (yr)',5(x,I6,3x))
  909 FORMAT(1H ,'  insurance         ($/yr)',5(x,F9.2))
  320 FORMAT(1H ,'  shelter cost      ($/yr)',5(x,F9.2))
  330 FORMAT(1H ,'  repair(% purchase price)',5(x,F9.2))
  340 FORMAT(1H ,'  repair cost          ($)',5(x,F9.2))
  350 FORMAT(1H ,'  annual cost          ($)',5(x,F9.2))
  360 FORMAT(1H ,'  annual cash flow     ($)',5(x,F9.2))
c
c
  370 FORMAT(1H ,   74('-'))
c
      WRITE(LURT,1023)
 1023 FORMAT(1H0,'  @ % of purchase price.')
c
      K1 = K1 +1
  700 CONTINUE
c
      CLOSE(UNIT=5)
      CLOSE(UNIT=7)
      CLOSE(UNIT=8)
      CLOSE(UNIT=9)
c
      RETURN
c
      END
```